POWERSMITHS

CYBERHAWK

Transformer Power Monitor

Cyberhawk-*TX*

USER MANUAL

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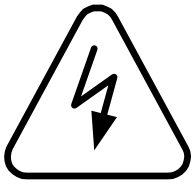
Safety Notice

Working on or around electrical devices presents a **Shock Hazard**, potentially leading to serious injury or death if safety precautions are not observed. Hence only qualified, competent personnel who have been trained in and are familiar with the **Risk of Electric Shock** and/or burns from **Plasma Arcs** should perform installation and maintenance of the unit. It is solely the **responsibility of the installer** to be fully aware of all necessary safety regulations and procedures and **be familiar with the installation instructions detailed in this manual**.

*IT IS IMPERATIVE THAT **POWER BE PROVEN DISCONNECTED** BEFORE ANY WORK ON OR PHYSICAL CONTACT TO ELECTRICAL CIRCUITS IS ATTEMPTED: **DO NOT ASSUME BUT CHECK** ACROSS THE LINES AND TO GROUND WITH A METER AND ENSURE THAT THE SOURCE **DISCONNECTION DEVICES ARE LOCKED OUT** FOR YOUR SAFETY.*

*IF WORKING IN CLOSE PROXIMITY TO LIVE INSTALLATIONS, THE **INSTALLER MUST BE SUITABLY TRAINED AND AUTHORIZED** TO WORK IN SUCH SITUATIONS AND BE FULLY ACQUAINTED WITH THE **RISKS OF ELECTRICAL SHOCK** AND/OR **BURNS FROM PLASMA ARCS** CAUSED BY INADVERTENT SHORTS, AND TAKE **ALL NECESSARY SAFETY PRECAUTIONS** WHICH WILL INCLUDE BUT NOT LIMITED TO THE USE OF ELECTRICALLY INSULATED GLOVES, SAFETY GOGGLES, AND REMOVE ANY METALLIC OBJECTS (JEWELRY, WATCHES ETC.) FROM THEIR PERSON.*

WARNING



ELECTRIC SHOCK RISK

- Hazardous voltages from several sources are present on the terminals. Ensure that all external power sources are de-energized prior to handling
- Energized and open-circuited CTs (Current Transformers) can generate potentially lethal voltages. Use Shorting CT Blocks for safe maintenance
- Refer all servicing to qualified personnel
- Wire and Hookup following all local Safety Codes (e.g. NEC)

CAUTION

- Failure to observe the voltage and current limitations of this device specified in this manual could result in permanent damage to the unit
- The ground connection in the instrument must be securely connected to an earth ground for both safety of the operator and for correct operation
- Utility power is only conned to the fused Voltage Terminals. Do not connect any power source to any Digital I/Os, Analog inputs or communication ports

Standards Compliance:

UL 916

FCC Part 15 Class A

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Table of Contents

List of Figures & Tables

1 Overview

The information in this manual describes both the operation and setup of the unit's user programmable capability.

Note that the unit is shipped already factory setup and should require no user setup except for the communication ports.

1.1 Description

The *Cyberhawk-Tx* is a comprehensive Metering and Power Monitoring System based on the Powersmiths Cyberhawk-PMP30 Power Management Platform with extensive user programmable functions. It is available with up to three input Ports making it suitable for application in both single and dual output transformers. It is equipped with a standard RS485 Port supporting Modbus RTU with and an optional Ethernet Port with Modbus TCP Gateway capability and/or WEB server for remote anywhere anytime access to live and logged data using only an Internet Browser.

1.2 Application

The unit's energy measurement and monitoring capability will provide for Energy Management, Power Quality Monitoring, and Diagnosis of Power Quality related Equipment failures. The time/date stamped Event logs may be used for diagnostic, remedial and maintenance purposes. It also provides an easy means of auditing energy usage to provide informed guidance on Energy management solutions and financial decisions. A typical application is shown below.

1.3 The Hardware

The Powersmiths *Cyberhawk-TX* is based on the Powersmiths *Cyberhawk PMP-30* (Power Management Platform), which is a multi-function metering, monitoring and control device. It is packaged in a NEMA 2 case with a ¼ VGA graphic Touch Screen display mounted on the top right corner of the transformer enclosure. Current data is sensed via transformer mounted CTs and Voltage via fused terminal disconnects interfaced to the transformer through DIN compression terminals.

1.4 Data

Measurement parameters for up to three Ports include:

- Voltages, Currents (Line and Neutral), Frequency
- Power Factor (Total and Displacement), Distortion (THD & DIN), Crest and K-Factor
- Power (kW, kVA, kVAR), Energy (kWh, kVAh, kVARh)
- Total Demand (kWd, kVAd, kVARd, PFd, DPFd)
- Efficiency (Instantaneous, Demand and Average for 2/3-Port Models only)
- Temperatures (4 max.)
- Waveforms (Voltage and Current)
- Trend Logs (20 parameters)

1.5 Alarms and Event Recording

The instrument includes an extensive list of monitored parameters for which set out of limit conditions may be set and an event log generated. Events may also be programmed to initiate an output action (e.g. Summary alarm contact, Relay output, Digital output or Horn) subject to set delays. Also included in the recorded events are Sags and Swells with full user control over set parameters.

Monitored conditions that can be set to trigger an Event* (Alarm) with Time/Date Stamps include:

- High and Low Voltages
- Voltage Sags and Swells (1/2 Cycle detection) with three independent detection blocks
- Voltage Imbalance
- Loss of Phase
- Phase reversal
- Frequency
- High Currents (two levels) including Neutral
- Temperatures
- SPD (TVSS Status)

1.6 Data Logging and Trending (WEB Server option)

When equipped with a WEB Server, the unit has the ability to log up to 20 parameters in 1 minute increments or longer, in a circular butter, which may be viewed as trend graphs over an Ethernet connection. Typically, logging of 20 parameters in 5 minute intervals will provide a useful logging period of about one month (fewer parameters or a longer period will increase this time).

1.7 Communication

The *Cyberhawk-TX* is equipped with a RS485 Port supporting Modbus RTU (typically used for Building Management System support). It may also be optionally equipped with an integrated Ethernet port available in two versions; an Ethernet Gateway supporting Modbus TCP or a full WEB Server and Ethernet Gateway that permits convenient anytime anywhere access to all measurement parameters and recorded logs at a remote computer with only an Internet Browser.

1.8 Power

The device is powered directly from the system bus from all phases and has the capability to "ride-through" sags of to < 50% of nominal so as to maintain monitoring functions during extreme power quality conditions.

1.9 User Interface

The unit interacts locally with the *"Touch Screen"* display, guided by the context sensitive menu and remotely over Ethernet using a standard IE Browser with the WEB Server option.

1.10 Menu Structure

Operation of the unit is driven by context sensitive Menu selections on the touch screen display making the unit very user friendly to operate. The setup menus are protected by password to prevent inadvertent changes or unauthorized tampering.

An overview of the menu structure in shown in the figure below:

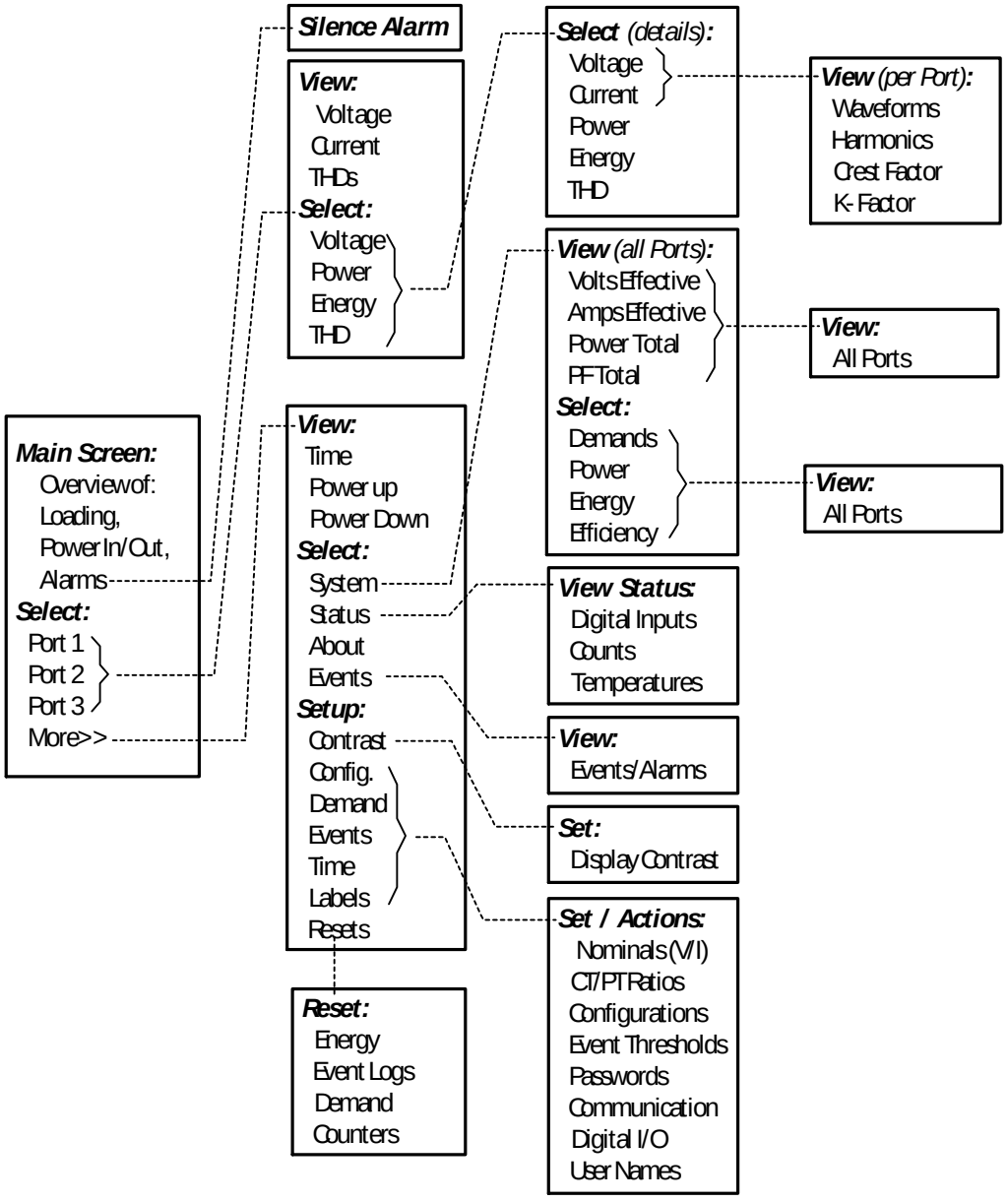


Figure 1-1: Menu Structure

2 Operational Guides

2.1 Introduction

Use of this operational guide assumes that the unit has been installed and setup.

Note that the Port names are user settable and factory assigned as Input and Output; the default names are 'Port 1" "Port 2" or "Port 3" and may be changed by the user.

2.1.1 Syntax

The following symbols are used in this manual:

⇒: Select and depress button (on Touch Screen)

[####] Button identification with ID within box

Note: Where **[Port 1]**, **[Port 2]** or **[Port 3]** is *referenced, use the user assigned name instead for example* **[Input]**, **[Output]** *etc.*

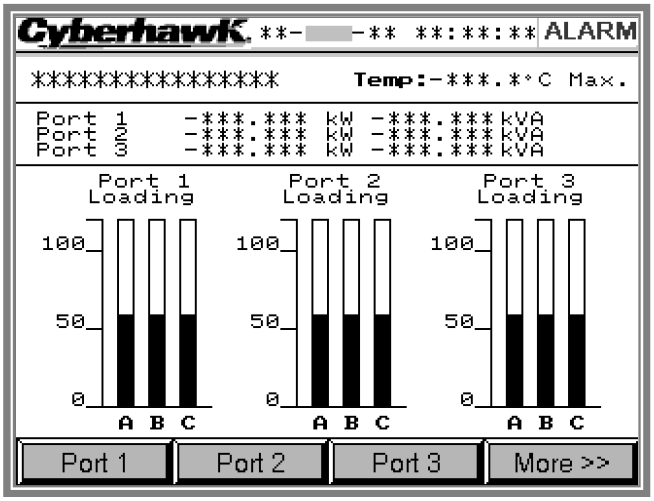
2.2 Main Screens

The user interacts with the unit via the menu driven context sensitive graphic "Touch Screen" display making it extremely simple to operate.

The **[More>>]** buttons selects more menus and the **[Back]** button takes the user back one screen at a time. Specific descriptions are given for each screen type.

2.2.1 Main Screens

The main screen shows an overview of the loading and the main electrical power parameters.



Status: Time/date, Active Alarm

Model Info and Temperature

Total kW and kVA (per Port)

Percent Loading (at left)

Menu Selections

Figure 2-1: Main (default) screen for a dual output ES (two bar graphs for single output)

Note: **[Port 1]** **[Port 2]** and **[Port 3]** *are the default names and may be changed by the user.*

2.2.2 Active Alarms and Horn Silence

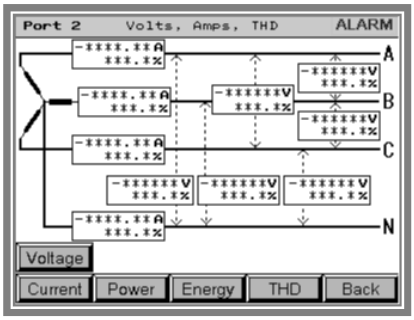
A current active Alarm (generated by an Event), is indicated by a visual **[Alarm]** button on the left corner of the display.

To silence the Horn at the Screen:

⇒ **[Alarm]** or ⇒ **[More>>]** ⇒ **[Silence]** *(available during an active Alarm)*

2.2.3 Accessing Data at the Display

⇒ **Input** ⇒ **Output** *or user assigned name*



Summary screen: voltages, L-L and L-N, and line currents together with the V & I THD for each in a diagrammatic form with further selections for tabulated details.

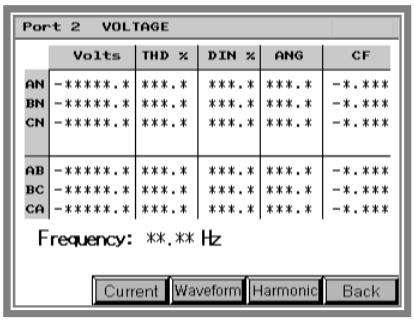
⇒ **Voltage**

⇒ **Current**

⇒ **Power**

⇒ **Energy**

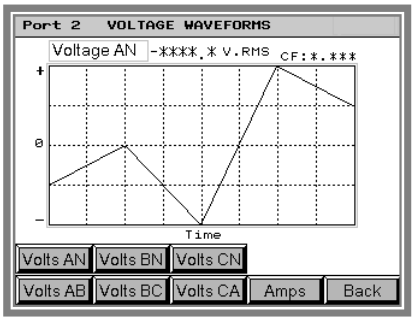
⇒ **THD**



Typical data screen shown for "Voltage" selection

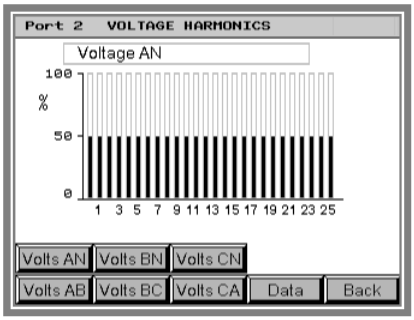
⇒ **Waveform** *(from Voltage or Current fields)*

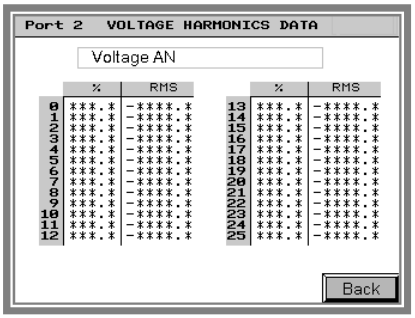
Display voltage or current waveforms with Crest Factor and K-Factor



⇒ **Harmonics** for Bar graphs *(from Voltage or Current fields)*

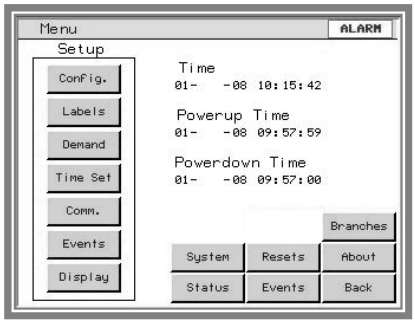
⇒ **Data** for Harmonic numeric data





2.2.4 Expanded Menus

⇒ **More** (For expanded menu selections) or **Back**



Note: Also shows current time and last power up and power down time.

Note: **Silence** *button (not shown) is only available during an active Alarm*

⇒ **System** Summary of System data

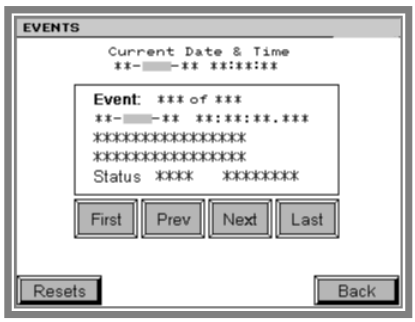
⇒ **Branches** Branch Circuits see "Branch Circuits following.

⇒ **Resets** see Resets following

⇒ **Events** List of all events (Alarms)

⇒ **First** ⇒ **Prev** ⇒ **Next** ⇒ **Last** to scroll the event list

⇒ **Resets** for quick access to “Resets” screen (requires password).

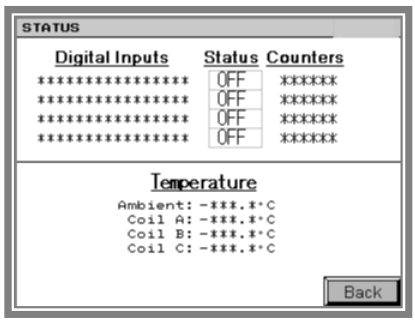


⇒ **Status**

For status of all Inputs

- Status Digital Inputs
- Digital Input Counts
- Temperatures

⇒ **About** **(**Displays relevant information about the Firmware and HMI Versions, Calibration Date and Serial Number



2.2.5 Basic Setup Parameters

The following are the available Setup selections; refer to section on Setup for full details.

⇒ **More>>** to access to setup menu (left column)

⇒ **Contrast** to set screen contrast

⇒ **Config.** to configure meter for system

⇒ **Demand** to set demand periods

⇒ **Events** to setup event parameters

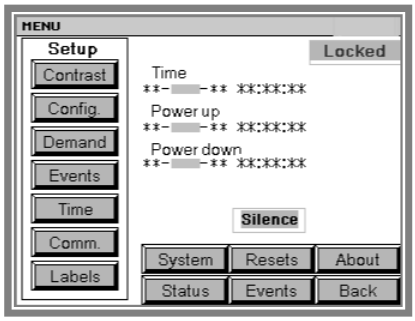
⇒ **Time** to set time

⇒ **Comm.** to set communication parameters

⇒ **Labels** for user assigned names

⇒ **Locked** to unlock or change password (top right)

⇒ **Resets** for resets (bottom middle)

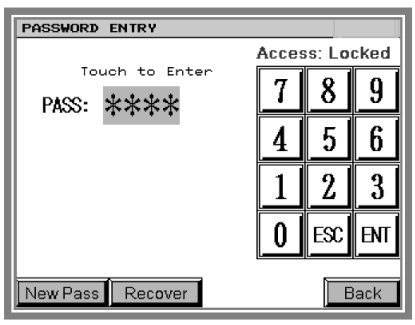


2.2.5.1 Password Unlock

⇒ **Locked**

⇒ **####** Enter password to unlock unit (default “0”)

⇒ **Back**



2.2.5.2 Resets

⇒ **Resets**

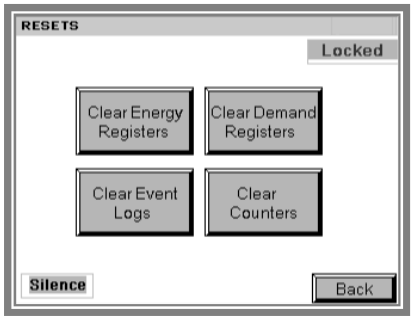
⇒ Clear Energy Registers

⇒ Clear Demand Registers

⇒ **Clear Event Logs**

⇒ Clear Counters

Note: **Silence** button available during an active Alarm



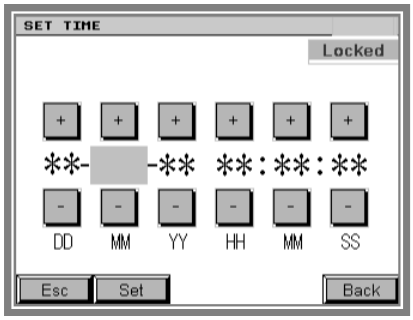
2.2.5.3 Time set

⇒ **Time**

⇒ + and ⇒ - to change time

⇒ **Set** to set

⇒ **ESC** to abort



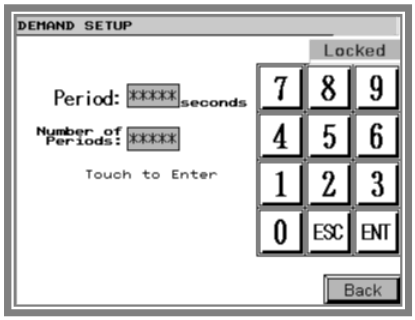
2.2.5.4 Demand Period Set

For sliding block

⇒ Demand

Period ⇒ #### in seconds (60 secs. Typical)

Number of Periods ⇒ #### (15 typical)



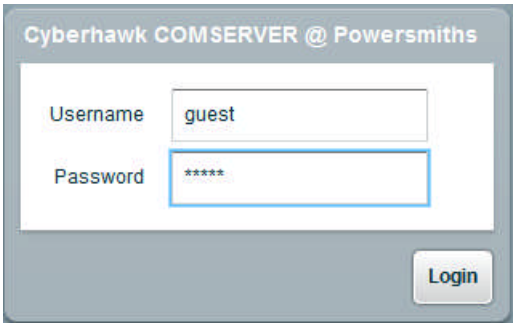
2.2.5.5 Contrast

⇒ **More>>** from Main

⇒ Contrast

Use + and - buttons for desired contrast and **ESC** when done

2.2.6 Network Access



On PC, WEB Browser such as Internet Explorer or Firefox and in the address bar type:

[http://*.***.***.***]**

(the user assigned Cyberhawk Ethernet address)

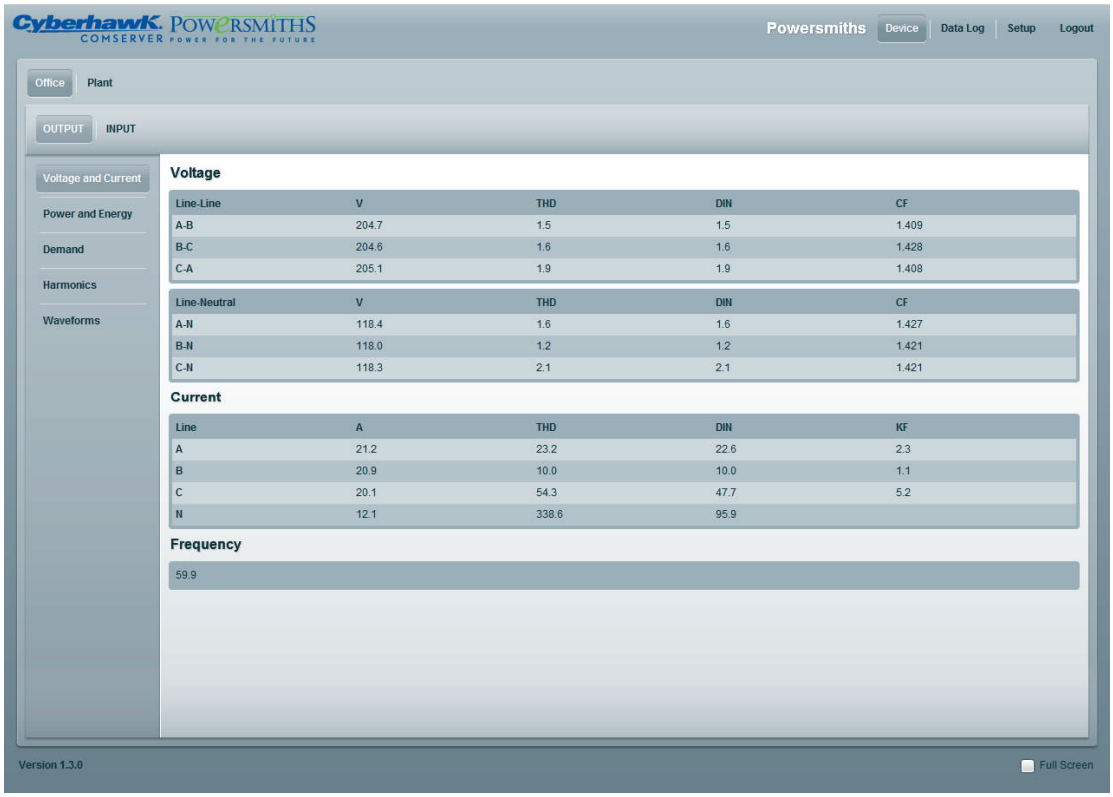
⇒ User name: ***guest***; Password: ***guest*** in dialog box displayed

Select from displayed menu

Note: Setup requires logging in as an administrator

Alternatively use the Powersmiths Network Utility to locate all Powersmiths connected network devices and follow on screen instructions (see Comserver Manual for more details).

When logged in a typical browser screen will be as shown below:



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3 Programming Setup

The monitor is initially programmed using data provided by the user or with default setups which may be modified or changed by the user. A record of the setup values is normally packed with the unit. Programming may be done manually at the touch screen or by use of the Cyberhawk Setup Utility software utility available from *www.powersmiths.com/download* and select Cyberhawk Setup Utility. This utility operates over RS232, RS485 or over Ethernet

Note: To program over RS485 a USB to RS485 dongle may be required available for computer suppliers or Powersmiths. Also programming over Ethernet a key file is required directly by request to Powersmiths (for security reasons)

3.1 General Setup Procedures

The following are a list of parameters that are user settable under password protection:

- Unit/Port Names/Labels
- System Parameters (Voltage, Current, Port(s) Configuration)
- PT/CT Ratios and Correction factors
- Time and Date
- Events (Alarms) with output actions
- Demands
- Passwords
- Communication
- Screen Contrast
- Resets
- User assigned names for Ports, Digital I/Os and Unit ID
- Unit IP address*
- Logging parameters*

**Note: Refer to Powersmiths Comserver Manual and Powersmiths Network Setup utility available from www.powersmiths.com/download.*

3.2 Setup using Powersmiths Software Setup Utility

The Setup Utility is available from www.powersmiths.com/download and select Cyberhawk-300 Setup Utility, download and install following screen instructions.

Note: If programming over Ethernet is required please request key file from Powersmiths which will allow programming over the Ethernet connection which is disabled by default for security reasons

To use the Setup Utility follow following instructions with further information available in the `Help` menu:

- Make physical connection to desired to desired communication port

  Refer to communication ports under Installation Section of this manual for internal connections

  To use the RS232 connection it will be necessary do disconnect the display connection at the Monitor (Cyberhawk-PMP 30) and connect using a Null-Modem RS232 cable

  To program over RS485 a USB to RS485 dongle may be required connected to Port 2 (TB3)

  To connect directly to Ethernet Port without a network connection use a cross-wired Ethernet cable
- Start Setup Utility to be found at start menu under Powersmiths
- Select ***Communication Setup*** button and select communication parameters in open dialog box
  - ***Serial*** or ***Ethernet***
  - Serial communication parameters with serial communications (defaults to unit defaults) including Modbus address

    Note: Modbus addresses may be other than default with multiple monitors or Load circuit monitoring (see test report)
  - ***IP Address*** with Ethernet connection

    *Note: When IP address is not known select **Find IP Address** button and then scan*

Only units on the same local network will be found

- Select ***OK*** to close dialog box and then depress ***Connect…*** button or select ***Auto Connect***

- Select actions as required
  - Under Setup menu boxes select items to be programmed and enter required values into popup dialog box

    *Tip: Current set values may be uploaded by selecting the **Read Setup** button under programming tab*
  - ***Write Setup*** when finished programming setup

    *Written setup may be verified using **Verify** button*
- Select ***Resets...*** Button to reset the following registers: Energy, Pulse Counters, Event Logs
- ***Save Setup File*** permits the user to save the file for reference or future reprogramming

  Note: The file is saved in `Saves` the default save directory or in any location selected by the user
- ***Recall Setup File*** permits the user to read in a previously save file or one prepared by Powersmiths to the user requirements
- ***Report Preview*** button shows all set or uploaded values and may printed for a hard copy record
- ***Silence Horn*** buttons silences alarm
- Password recovery is accomplished via the ***Connection Setup*** button and select ***Find Password***
- Live data may be viewed when the connection is active by selecting ***Live Data***

3.3 *Setup at the Screen*

The following symbols are used in this manual:

⇒: Select and depress button (on Touch Screen)

Button identification with ID within box

Note: Where assigned names **Input**, **Output** or **Output2** are *referenced (use the user assigned name if changed)*

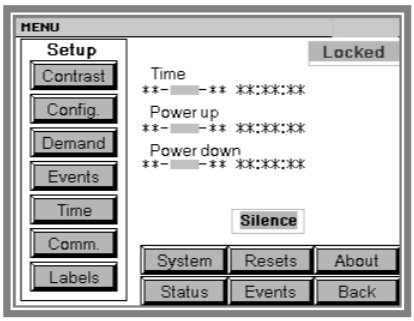
Note the following prior to setup:

- Login using a valid 4-digit password (factory default is **"0"** which can be changed by the user after login)

  Note that a status flag **Locked** *and* **Unlocked** *is displayed to indicate login status; login expires in thirty (30) minutes, if no entry activity is detected.*
- To cancel an undesired entry, ⇒ **ESC** on the displayed keypad prior ⇒ **ENT**.
- To exit a screen after password is expired, clear any highlighted field by pressing **ESC** on the displayed keypad to allow the ⇒ **Back** buttons to operate
- ⇒ **####** to select the setup parameter
- Record any new selected passwords or the user will be locked out
- Password recovery: The unit cannot normally be 'unlocked' without a valid password. However, the password may be recovered by using the Cyberhawk Setup Utility; refer to the appropriate section of this manual.

3.3.1 Setup

Menu Selections:



⇒ **More>>** to access to setup menu (left column)

⇒ **Contrast** to set screen contrast

⇒ **Config.** to configure meter for system

⇒ **Demand** to set demand periods

⇒ **Events** to setup event parameters

⇒ **Time** to set time

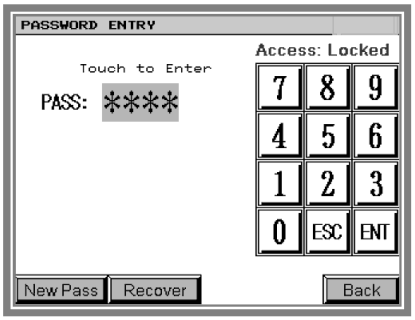
⇒ **Comm.** to set communication parameters

⇒ **Labels** for user assigned names

⇒ **Locked** to unlock or change password (top right)

⇒ **Resets** for resets (bottom middle)

3.3.2 Password Unlock



⇒ **More>>** ⇒ **Locked**

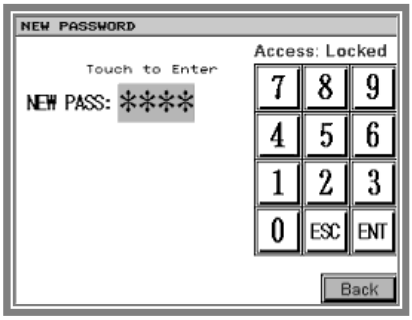
⇒ **####** Enter password (default "0") using keyboard and

⇒ **ENT** and "Access Unlocked" will be displayed if successful

⇒ **Back** for Setup menu

Note: Unit will automatically lock itself after 30 minutes of no activity

3.3.3 Password Change



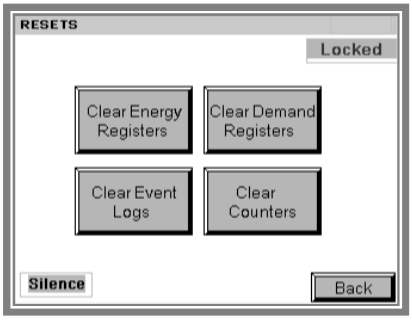
⇒ **New Pass** in the password entry field after login

⇒ **####** (Password field) enter a new password in keypad and

⇒ **ENT** key *(Be sure to record the new password)*

⇒ **Back** ⇒ **Back** to return to Setup Menu

3.3.4 Resets



⇒ **Resets**

⇒ Clear Energy Registers

⇒ Clear Demand Registers

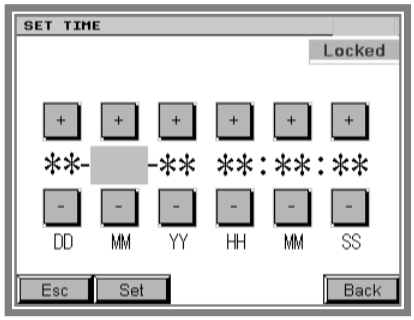
⇒ **Clear Event Logs**

⇒ Clear Counters

⇒ **Back** to return to Setup Menu

Note: **Silence** button available during an active Alarm

3.3.5 Time set



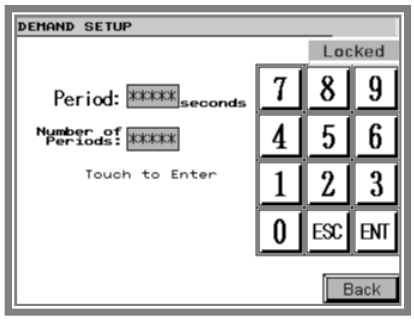
⇒ **Time**

⇒ + and ⇒ - to change time

⇒ **Set** to set

⇒ **ESC** to abort

3.3.6 Demand Period Set



For sliding block

⇒ Demand

Period ⇒ #### in seconds (60 secs. Typical)

Number of Periods ⇒ #### (15 typical)

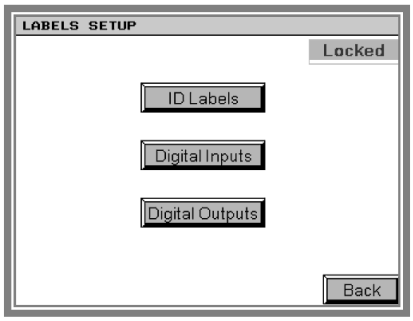
3.3.7 Contrast

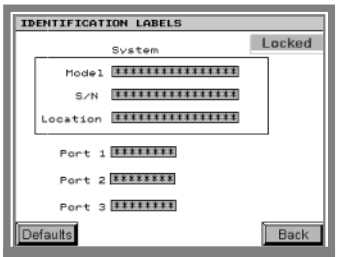
⇒ **More>>** from Main

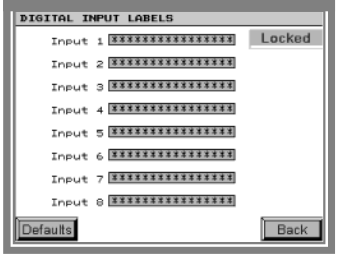
⇒ Contrast

Use + and - buttons for desired contrast and **ESC** when done

3.3.8 Labels







The Names (Labels) assigned to Meter Ports, Digital Inputs and Outputs can be set by the user in alpha numeric format; this provides a more user-friendly interaction with the unit. Access as shown below and follow procedure described following:

⇒ **Labels** and select from:

⇒ **ID Labels** Names for Ports, Unit ID and Serial Number

⇒ #### Location (16 digits), Port 1, Port 2, Port 3 (8 digits)

⇒ **Digital Inputs** Names for Digital Inputs

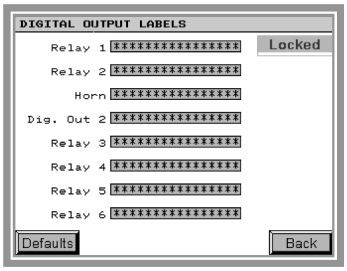
⇒ #### Input 1 - 8 (16 digits)

⇒ **Digital Outputs** Names for Digital Outputs

⇒ #### Relay 1, Relay 2, Horn (default), Dig Out 2, Relay 3 – 6 (16 digits)

Note: **Model and System S/N** *are factory set and should not be changed; Default Port names are the same as the hardware Port designation.*

3.3.8.1 Label Assignment Procedures



- Select Label category from list above
- Touch the field [####] to be named or changed
- Enter Name using popup keyboard and ⇒ **[ENT]**
- Back for next parameter

3.3.9 System Parameters

The unit would have been configured for the following parameters prior to shipment and should not be changed but described for reference only:

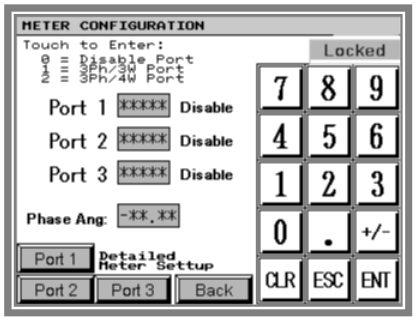
- System Parameters (Nominal Voltage and Current)
- Measurement Port Configuration (3-wire or 4-wire)
- PT/CT Ratios and Correction factors

Note that these values are provided for reference only should not be changed as they are specific to the system configuration of the unit.

Table 3-1: Setup measurement parameters

Item	Selection
Nominal System Voltage	Nominal System L - L Voltage
Primary CT Ratio*	5 - 9,000 Amps
System Configure	0 = Disabled 1 = 3-wire (Delta): 2 wattmeter method 2 = 4-wire (Wye): 3 wattmeter method
Nominal Current	Nominal Line Current
Input/output Assignment	0 = No assignment 1 = Input 2 = Output

3.3.9.1 Port Configuration



Set System Configuration:

⇒ **[Config]**

⇒ [####] field under Meter Configuration for Port 1

Meter Configuration Port 1/2/3 ⇒ [####] "**1**" for 3-wire system

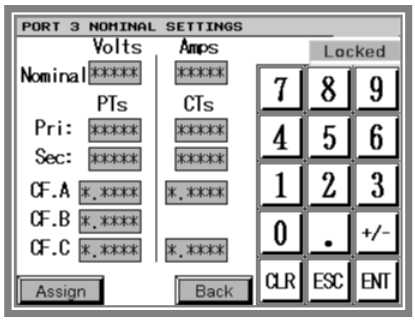
"**2**" for 4-wire system then ⇒ **[ENT]** "**0**" to disable

*Note Any Port not used be set **"0" (**disabled)*

⇒ **[Back]**

Note: Unit may be cycled ON/OFF by opening and closing internal control fuses

3.3.9.2 Port Measurement Ranges



From **Config** screen select **[Port 1]** **[Port 2]** and **[Port 3]** each in turn for the following:

3.3.9.2.1 Nominal Voltage and Current

⇒**Nominal Volts** [####] field and enter the nominal Line-Line system voltage (208, 400 480, 600, etc) on keypad and ⇒ **[ENT]**

⇒ **Nominal Amps** [####] field and enter the nominal Line current computed as follows:

$$3\,\phi: I = \frac{S}{\sqrt{3}.V_L}$$ *Where S is the Total Power of the system in rated VA*

Then ⇒ **ENT** on keypad

3.3.9.2.2 PT Ratios and Correction Factors

*Note: **PT data must be entered even if there are no PTs** installed in the system, where the primary and secondary voltages are **set to the nominal system voltages** for the Port*

⇒**Volts PT Prim.** #### field and enter Nominal System Voltage (PT primary Voltage with PT)

⇒**Volts PT Sec.** #### field and enter Nominal System Voltage PT secondary Voltage with PT)

⇒**Volts PT CF. A (B) & (C)** #### Correction factors for PTs if applicable (default is 1.00000)

Note: Correction factors for the PTs are entered on this screen. The limit for values entered is 1.1000 maximum. to 0.9000 minimum. When using 3-wire configurations, enter correction factors only for the two phases where the PTs are installed with the remaining phase set at 1.0000.

3.3.9.2.3 CT Ratios and Correction Factors

Note: The CT ratios are expressed as primary currents relative to the secondary CT current (5Amps)

⇒**Amps CTs Prim.** #### field and enter CT primary current

⇒**Amps CTs CF A (B) & (C)** #### Correction factors for CTs if applicable (default is 1.00000)

For phase correction ⇒ **Back** ⇒ #### Phase angle field (default is 0.3 for standard revenue class CTs and 0.7 for Split core types)

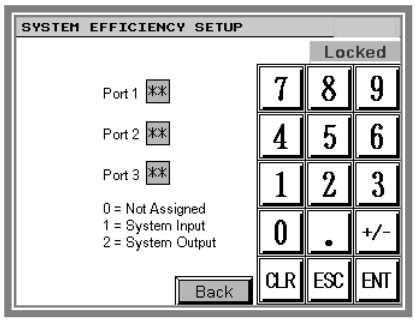
Note: Correction factors phase error compensation are entered on this screen. The limit for values entered is 1.1000 maximum. to 0.9000 minimum. Phase compensation for external CTs is entered in degrees with limits at ± 3.0000 degrees. When using 3-wire configurations, enter correction factors only for the two phases where the CTs are installed with the remaining phase set at 1.0000.

3.3.9.2.4 System Port Assignment

The Ports are assigned as an Input or an Output and is used for system efficiency calculations; this feature requires at least two Ports.

Select ⇒ **Assign**

⇒ **Port (1/2/3)** #### field and enter as follows:



Port Assignment	Assign to Port
Port 1	0 – Not assigned 1 – System Input* 2 – System Output*
Port 2	
Port 3	

**Note: Used for efficiency computations only*

3.3.10 Events (Alarms)

The following Parameters are monitored and are fully user programmable for threshold and for Alarm action with user settable delays.

Event Parameters are as follows:

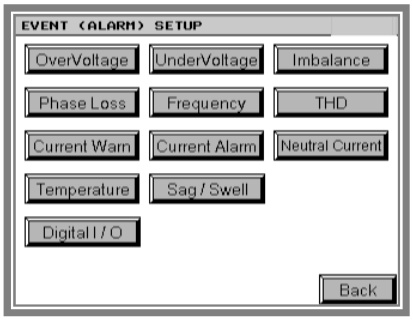
- Over Voltage (per Port/phase/line)
- Under Voltage (per Port/phase/line)
- Voltage Imbalance (per Port)
- Phase Loss (per Port/line)
- Frequency (per Port)
- Over Current Warning (per Port/line)
- Over Current (per Port/line)
- Over Current Neutral (per 4-wire Port)
- Over Temperature (3 Inputs plus 1 Ambient)
- Sags and Swells (per Port/line for Delta and Port/phase for Wye)
- Digital Input Alarms (4 Digital plus 4 with I/O, EPO activation)
- Phase Rotation (per Port and part of digital alarms)

Events may be programmed to generate the following actions as follows:

- Log Event with Date/Time
- Operate Relay Outputs (Alarm and/or Control)
- Operate Horn
- Operate Digital Outputs

Other Events generated and logged by the unit but are not user programmable include:

- Power Down
- Restart
- Logs Cleared
- Battery (clock) Low



To access Event Setup:

⇒ **More>>** under **Setups** ⇒ **Events** then select required parameter

3.3.10.1 General Event Setup Procedures

All Events must be programmed to make them active and for the output action required, the default state is off (disabled). Event setup follows the following sequence:

- Thresholds
  - Set the Thresholds and Hysteresis for the Event (alarm)
- Delay
  - Set Delay On Off times
- Output Actions
  - Set the required output actions including Logs and Outputs

3.3.10.2 Event Output Action Programming

Note: This is a general note on Output programming (Relays and Digital Outputs) which is applicable to all Event setups so it is covered prior. Relays 3 – 6 are not installed in this application.

The output actions of an Event are user set as a digital string (9 bits) and are entered by inputting a series of ones (1) (to enable) and zeros (0) (to disable). It is recommended that the digital string be worked out and jotted down on a piece of paper prior to entry. As example the string {100000101} programs the unit to log events and operate the horn output (D1) and the Relay R1. The table below lists the programmable outputs:

Table 3-2: Table of programmable outputs

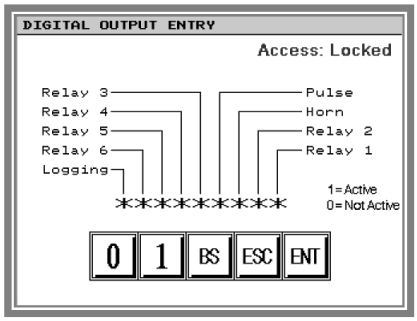
Item	**Output Action Programming**								
Bit Number	9	8	7	6	5	4	3	2	1
Output ID	Event Enable	Relay 6	Relay 5	Relay 4	Relay 3	Digital O/P-2	Digital O/P-1	Relay 2 (Aux 2)	Relay 1 (Aux 1)
Location	Internal Logic	Ext. I/O	Ext. I/O	Ext. I/O	Ext. I/O	TB 5 Pins 4/6	TB 5 Pins 3/6	TB 2 Pins 4-6	TB 2 Pins 1-3
Default Assignment	User Defined	User Defined	User Defined	User Defined	User Defined	User Defined	Horn	User Defined	User Defined
Typical String Format	1	0	0	0	0	0	1	0	1
	Enabled	Disabled	Disabled	Disabled	Disabled	Disabled	Enabled	Disabled	Enabled

The programming screen for inputting the required operational string is shown following. From the particular event screen:

⇒ **Output Action** [#########]

⇒ [###] enter 9-digit string (using the "0" and "1" buttons)

⇒ [**ENT**] (returns to the Event Screen)



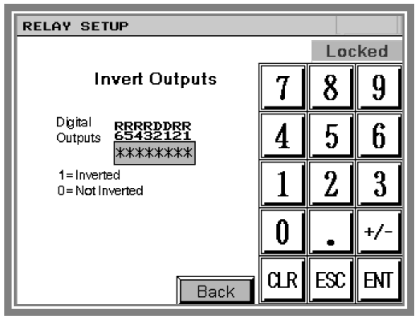
Note: The following buttons:

- *BS – Backspace*
- *ESC – Escape, returns to previous screen without changes*
- *ENT – Enter, enters setting and returns to previous screen*

Note: The programmed operation can be checked when returned to the Events screen

3.3.10.3 Output Polarity reversal

All outputs are normally de-energized in normal operation. The polarity of operation of these Outputs (Relays and Digital Outputs) can be reversed under this screen. For normal operation "0" (default) is entered, enter "1" for inverted operation.



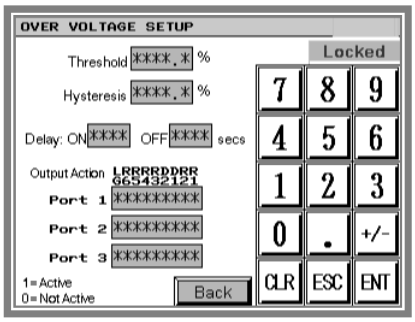
To reverse the polarity of the Outputs, from the Events Setup screen select:

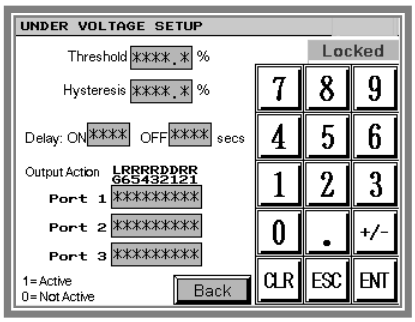
⇒ [**Outputs**]

Invert Outputs ⇒ [####] enter string for required polarity (0 for each normal and 1 for reverse polarity

⇒ [**ENT**] ⇒ [**Back**] to return to the Digital I/O setup screen

3.3.10.4 Over Voltage / Under Voltage





The Over-voltage and Under-voltage event thresholds are set globally for all meters ports and are based on percentage of the nominal system values. Delays may be set as required for delay in activation time and delay in recovery in seconds. From the Events setup screen:

⇒ **OverVoltage** or **UnderVoltage** each in turn as required

⇒ **Threshold** #### enter value in % of Nominal ⇒ **ENT**

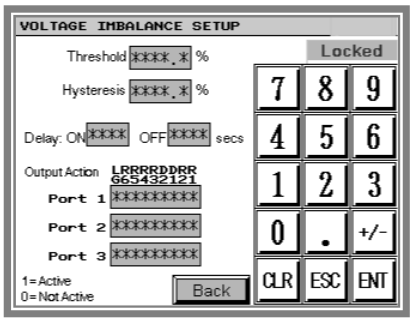
⇒ **Hysteresis** #### enter value in % of Nominal ⇒ **ENT**

⇒ **Delay On** #### enter value in seconds ⇒ **ENT**

⇒ **Delay Off** #### enter value in seconds ⇒ **ENT**

⇒ **Output Action** #### **(**Port 3, Port 1 or Port 2, each in turn**)** enter string for required action (1 for each action 0 for no action) ⇒ **ENT** ⇒ **Back**

3.3.10.5 Voltage Imbalance



The Voltage Imbalance event thresholds are set globally for all meters ports and are based on percentage deviation from the average system line-to-line values. Delays may be set as required for delay in activation time and delay in recovery in seconds. From the Events Setup screen:

⇒ **Imbalance**

⇒ **Threshold** #### enter value in % of deviation from average and ⇒ **ENT**

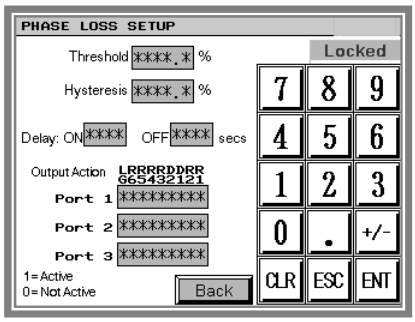
⇒ **Hysteresis** #### enter value in % of deviation from average ⇒ **ENT**

⇒ **Delay On** #### enter value in seconds ⇒ **ENT**

⇒ **Delay Off** #### enter value in seconds ⇒ **ENT**

⇒ **Output Action** #### **(**Port 3, Port 1 or Port 2, each in turn**)** enter string for required action (1 for each action 0 for no action) ⇒ **ENT** ⇒ **Back**

3.3.10.6 Phase Loss



The Phase Loss event thresholds are set globally for all meters ports and are based on percentage deviation from the Nominal system line-to-line values. Delays may be set as required for delay in activation time and delay in recovery. From the Events setup screen:

⇒ **Phase Loss**

⇒ **Threshold** #### enter value in % of deviation from Nominal and ⇒ **ENT**

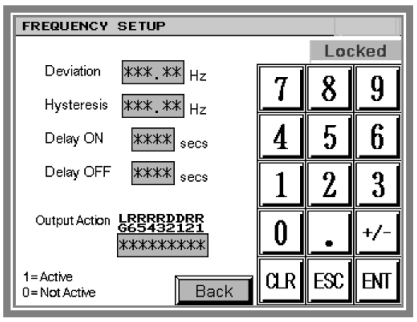
⇒ **Hysteresis** #### enter value in % of deviation from Nominal ⇒ **ENT**

⇒ **Delay On** #### enter value in seconds ⇒ **ENT**

⇒ **Delay Off** [####] enter value in seconds ⇒ **[ENT]**

⇒ **Output Action [**[####]**]** (Port 3, Port 1 or Port 2, each in turn**)** enter string for required action (1 for each action 0 for no action) ⇒ **[ENT]** ⇒ **[Back]**

3.3.10.7 Frequency



The Frequency event thresholds are set globally for all meters ports and are based on percentage deviation from the Nominal system frequency. Delays may be set as required for delay in activation time and delay in recovery in seconds. From the Events setup screen:

⇒ **[Phase Loss]**

⇒ **Threshold** [####] enter value in % of deviation from Nominal and ⇒ **[ENT]**

⇒ **Hysteresis** [####] enter value in % of deviation from Nominal and ⇒ **[ENT]**

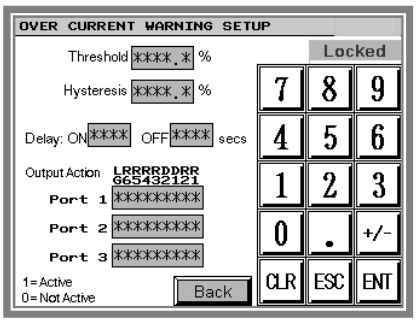
⇒ **Delay On** [####] enter value in seconds ⇒ **[ENT]**

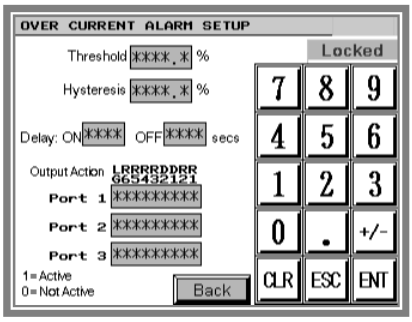
⇒ **Delay Off** [####] enter value in seconds ⇒ **[ENT]**

⇒ **Output Action** [####] enter string for required action (1 for each action 0 for no action)

⇒ **[ENT]** ⇒ **[Back]**

3.3.10.8 Over Current Warning / Over Current Alarm





The Over-current event thresholds (Warning and Alarm) are set globally for all meters ports and are based on percentage of the nominal system line currents. Delays may be set as required for delay in activation time and delay in recovery in seconds.

These Event Alarms are setup by navigating over to the Event setup Menu, then:

⇒ **[Current Warning]** or **[Current Alarm]** in turn as required

⇒ **Threshold** [####] enter value in % of Nominal ⇒ **[ENT]**

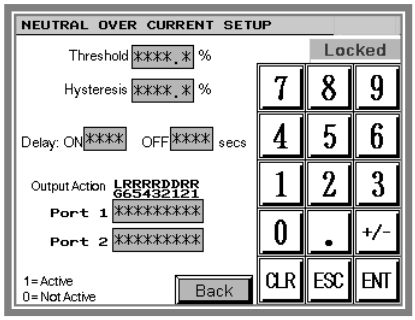
⇒ **Hysteresis** [####] enter value in % of Nominal ⇒ **[ENT]**

⇒ **Delay ON** [####] enter value in seconds ⇒ **[ENT]**

⇒ **Delay OFF** [####] enter value in seconds ⇒ **[ENT]**

⇒ **Output Action** [####] **(**Port 3, Port 1 or Port 2, each in turn**)** enter string for required action (1 for each action 0 for no action) and ⇒ **[ENT]** ⇒ **[Back]**

3.3.10.9 Neutral Over-current



The Neutral Over-current event thresholds are set globally for the two output meters ports and are based on percentage of the nominal system line currents. Delays may be set as required for delay in activation time and delay in recovery in seconds. From the Events setup screen:

⇒ **Neutral Current**

⇒ **Threshold** #### enter value in % of Nominal ⇒ **ENT**

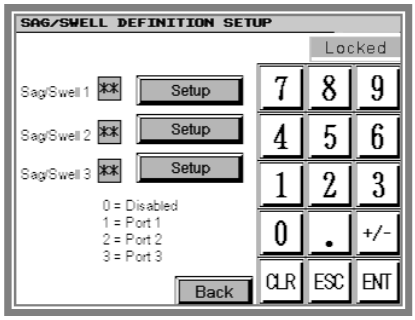
⇒ **Hysteresis** #### enter value in % of Nominal ⇒ **ENT**

⇒ **Delay On** #### enter value in seconds ⇒ **ENT**

⇒ **Delay Off** #### enter value in seconds and ⇒ **ENT**

⇒ **Output Action** #### **(**Port 1 or Port 2, each in turn**)** enter string for required action (1 for each action 0 for no action) ⇒ **ENT** ⇒ **Back**

3.3.10.10 Sags and Swells



Sag and Swell setups are used to detect fast (1/2 cycle) events which may be logged and/or to operate the Over or Under voltage protective function There are three (3) Sag/Swell detection blocks that may be assigned to particular Ports; for example all three detection blocks may be assigned to one particular port and used to accomplish different actions or alternatively one to each port. The Sag / Swell event thresholds are set and are based on percentage of the nominal system values. Delays may be set as required for delay in activation time and delay in recovery and set in numbers of quarter (1/4) cycles. Please refer to the following notes prior to setup

- When a delay is added in the setup ('ON' or 'OFF'), log is recorded as 'Trip'
- Sag/Swell detection operates L-L for 3-wire configuration and L-N for 4-wire configurations.

To access Sag/Swell setup:

⇒ **More>>** **Setup** ⇒ **Events**

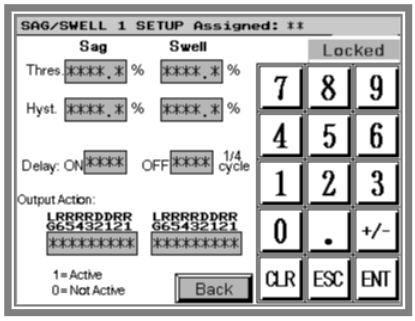
⇒ **Sag/Swell**

⇒ ## to assign Sag/Swell Block as per table opposite

Note: Repeat for each of the three Sag/Swell blocks

Sag/Swell Block	Assign to Port
1	0 – Disabled 1 – Port 1 2 – Port 2 3 – Port 3
2	
3	

Set up the Sag/Swell Blocks after they are assigned to a meter Port as follows:



⇒ **Setup** to enter the Sag/Swell setup screen as shown below

⇒ **Sag Threshold** #### (trip) level in percentage of nominal ⇒ **ENT**

⇒ **Sag Hysteresis** #### (reset) in percentage of nominal

⇒ **ENT**

⇒ **Sag Output Action** #### enter string for required action (1 for each action 0 for no action)

⇒ **ENT**

⇒ **Swell Threshold** [####] (trip) level for Swell in percentage of nominal ⇒ [ENT]

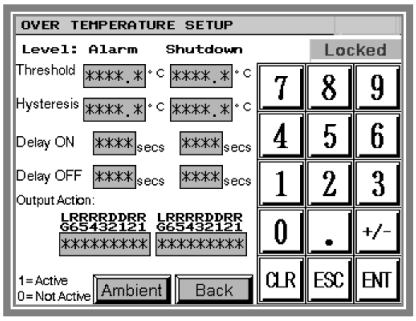
⇒ **Swell Hysteresis** [####] (reset) for Swell in percentage of nominal ⇒ [ENT]

⇒ **Swell Output Action** [####] enter string for required action (1 for each action 0 for no action) ⇒ [ENT]

⇒ **Delay On** [####] for Sags and Swells in numbers of ¼ cycles ⇒ [ENT]

⇒ **Delay Off** [####] for Sags and Swells in numbers of ¼ cycles ⇒ [ENT] ⇒ [Back]

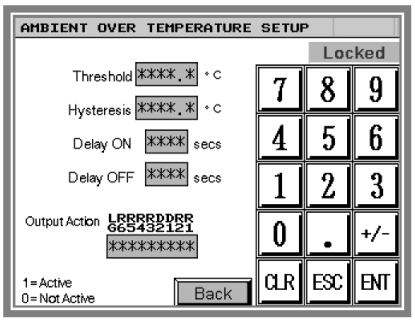
3.3.10.11 Over-Temperature



The Over-temperature thresholds are set globally for the device sensors (which must be installed for this to work) for both an Alarm (warning) level and a shutdown alarm level and are based on the actual temperatures set in ^{O}C. Delays may be set as required for delay in activation time and delay in recovery and set in seconds. An additional alarm is provided for ambient temperatures. From the Events setup screen:

⇒ [Over Temp.]

⇒ **Alarm Threshold** [####] **(**Alarm/Warning) enter value in ^{O}C ⇒ [ENT]



⇒ **Alarm Hysteresis** [####] (Alarm/Warning) ⇒ enter value in ^{O}C and ⇒ [ENT]

⇒ **Alarm Delay ON** [####] enter value in seconds ⇒ [ENT]

⇒ **Alarm Delay OFF** [####] enter value in seconds

⇒ [ENT]

⇒ **Alarm Output Action** [####] enter string for required action (1 for each action 0 for no action)

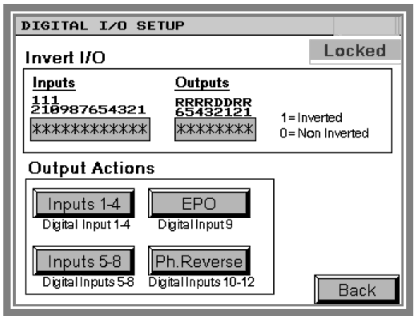
⇒ [ENT]

Repeat the foregoing for **Shutdown** levels

Select ⇒ [Ambient] and set levels as foregoing

⇒ [Back] ⇒ [Back] to return to Setup Selection screen

3.3.10.12 Digital Inputs



All the Digital Inputs and Outputs are programmed under this screen including input and output polarity settings and Phase Reversal sensing (three phase systems) which is treated as a digital input.

From the Events setup screen:

⇒ [Digital I/O]

3.3.10.12.1 Digital Input Polarity and Port Phase Reversal

The tables below list the Digital Inputs and Outputs and their default polarity assignments. To change the polarities of these, see instructions following the tables.

Table 3-3: Digital I/O Assignments

Digital Input	I.D	Default String Assignment	Description
Digital I/P-1	1	0	0 for Normally open state
Digital I/P-2	2	0	0 for Normally open state
Digital I/P-3	3	0	0 for Normally open state
Digital I/P-4	4	0	0 for Normally open state
Digital I/P-5	5	0	0 for Normally open state
Digital I/P-6	6	0	0 for Normally open state
Digital I/P-7	7	0	0 for Normally open state
Digital I/P-8	8	0	0 for Normally open state
EPO	9	0	0 for Normally open state
Port 1 Phase Reversal	10	0	0 for Clockwise Rotation. 1 for Anticlockwise rotation
Port 2 Phase Reversal	11	0	0 for Clockwise Rotation. 1 for Anticlockwise rotation
Port 3 Phase Reversal	12	0	0 for Clockwise Rotation. 1 for Anticlockwise rotation

To change the polarity of the digital inputs, enter the required 12-bit string as follows:

⇒ **Invert I/O Inputs** [####] and enter 12-bit string, (0 for normal 1 for inverted) ⇒ [**ENT**]

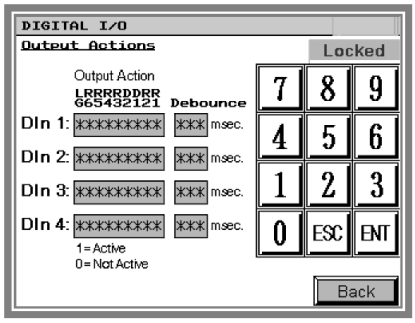
Table 3-4: Output Assignments

Digital Output	I.D	Default String Assignment	Description
Output-1	R1	0	0 for Normally OFF state
Output-2	R2	0	0 for Normally OFF state
Output-3	D1	0	0 for Normally OFF state
Output-4	D2	0	0 for Normally OFF state
Output-5	R3	0	0 for Normally OFF state
Output-6	R4	0	0 for Normally OFF state
Output-7	R5	0	0 for Normally OFF state
Output-8	R5	0	0 for Normally OFF state

To change the polarity of the digital outputs, enter the required 8-bit string as follows:

⇒ **Invert Outputs** [####] and enter 8-bit string, (0 for normal 1 for inverted) ⇒ [**ENT**]

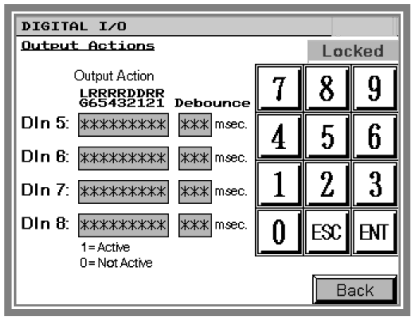
3.3.10.12.2 Digital Input Programming



There are a total of eight (8) Digital Inputs (4 on the main unit and 4 optional on the expansion I/O) and are used for sensing non-potential contacts in the external system. They may be programmed to operate as an event alarm, as normally open or normally closed, to log operation, debounce contacts, and produce an output action.

The Digital Inputs are setup from the Digital I/O setup screen and from this screen select:

⇒ **Digital Input Coding** [####] to set polarity (0 for normal 1 for inverted)

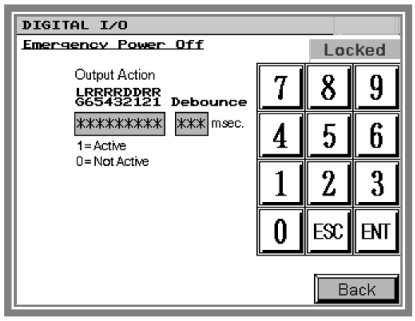


⇒ **Output Action Inputs 1-4 (or 5-8)** [####] enter string for required action for each digital input Din 1(5) through Din 4(8) (1 for each action 0 for no action) ⇒ [ENT]

⇒ **Debounce** [xxx] enter required debounce time in milliseconds (to 999 msecs.) ⇒ [ENT]

⇒ [Back] to return to the Digital I/O setup screen

3.3.10.12.3 EPO (Emergency Power Off)



This function is provided to record the operation of an external system EPO button. Setup from the Digital I/O screen is as follows:

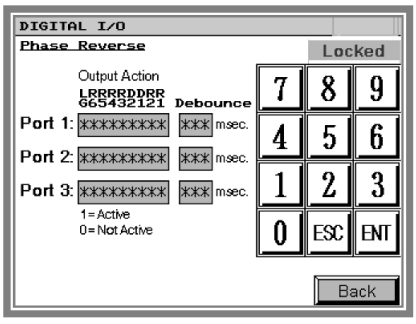
⇒ **EPO**

⇒ **Emergency Power Off** [####] enter string (1 for action 0 for no action) ⇒ [ENT]

⇒ **Debounce** [xxx] enter required debounce time in milliseconds (to 999 msecs.) ⇒ [ENT]

⇒ [Back] to return to the Digital I/O setup screen

3.3.10.12.4 Phase Reversal of Measurement Ports



This function provides an alarm for phase reversal of any of the Metering ports (Port 1 or Port 2, Port 3). Note that the normal phase rotation may be changed in the main Digital I/O setup screen. From the Events setup screen:

⇒ [Digital I/O] ⇒ [Ph. Reverse] (Phase Reversal)

⇒ **Output Action** [####] **(**Port 3, Port 1 or Port 2, each in turn**)** enter string for required action (1 for each action 0 for no action) ⇒ [ENT]

⇒ **Debounce** [xxx] enter required debounce time in milliseconds (to 999 msecs.) for each meter port

⇒ [ENT] ⇒ [Back] to return to the Digital I/O setup screen

3.4 Power Monitor Technical Specifications

Table 3-5: Table of Power Monitor Technical Specifications

Measurement:	
Ports:	1, 2 or 3 (configured for unit)
Configurations:	1-Φ D (2/3-wire, 1/2-CT) 3-Φ D (3-wire, 2-CT) 3-Φ Y (4-wire, 3-CT)
Voltage:	
Nominal:	480/600V or 208/120
Impedance:	5 M Ohms
Common Mode:	1,000 VAC
Protection:	Fused disconnect
Current:	
CT Input:	5A nom. 10 A max.
Burden:	1 VA max.
Accuracy:	
Voltage:	± 0.1% typical
Current:	± 0.1% typical
Frequency:	0.01Hz resolution (50/60Hz)
Sampling rate:	64 per cycle (V & I)
Power/Energy:	±0.5% (Class 0.5)
Neutral Current:	± 1% (derived)
Power Factor:	± 1% (PF & cos φ)
Distortion:	± 1% (THD & DIN)
Efficiency:	± 0.1% (in nom. range) (2 Port model only)
Drift:	< 0.01%/ ^{O}C
Computed:	
Resolution (ENOB): *(Effective No. Bits)*	13 (Voltage) 15 (Current)
Demand:	Block, Sliding Block
Power/Energy:	Per Phase and Total
Waveforms:	V & I (2 cycles)
Harmonics:	31Th (Numeric & Bar graph)
Power (operating):	
Source:	1-Φ or 3-Φ 50/60 Hz
Operating range:	-40% to +135% of nom.
Ride through:	> 200ms
Burden:	< 15W, 23VA
Relay Outputs:	
Number:	2 (independent)
Rating:	5A @ 250VAC/24VDC

Auxiliary Inputs:	
Digital::	4 (self-biased 24VDC)
Temperature:	4 (Type A Thermistors) 0 °C – 200°C
Human Interface:	
Standard:	¼ VGA Monochrome 3.8”
Options:	¼ VGA Monochrome 4.7” ¼ VGA Color 4.7”
User Input:	Touch Screen
Menu:	Context sensitive
Events (Alarms)**:**	
Parameters:	11 (All Measurements)
Functions:	User Programmable
Data Logs (trends)*:*	
Parameters:	20 max.
Log interval:	1 minute min.
Log Time: *(20 parameters)*	1 month typ. @ 5 min. int. (circular buffer)
Memory:	
Events:	1,024 (circular buffer)
Energy Data:	NV RAM Fail safe (dual copy)
Set-up:	NV RAM
Firmware:	Flash based, Field upgradeable
Clock:	
Back-up:	Battery (replaceable)
Accuracy:	± 3 secs./day
Communication:	
RS485:	
Protocol:	Modbus RTU
Bit rate:	1.2 to 19.2 kB
Connection:	2-wire
Isolation:	1,500V
Ethernet:	(option)
Bit rate:	10/100 BaseT
Protocol:	TCP/IP, HTTP, Modbus TCP
Isolation:	1,500V
Remote User Access:	IE Browser

Table 3-6: Table of Power Monitor Event Operation

Table of Event Functions

Parameter	Threshold Conditions	Hysteresis	Delay On/Off	Event Log
Over- Voltage	Percent Above Nominal per Port and per Phase	Percent Decrease for recovery	Seconds	Trigger ON/OFF & Maximum Level
Under-Voltage	Percent Below Nominal per Port and per Phase	Percent Increase for recovery	Seconds	Trigger ON/OFF & Minimum/Minimum level
Voltage Imbalance	Percent Deviation from average of all phases per Port	Percent Increase for recovery	Seconds	Trigger ON/OFF & Maximum level
Phase Loss	Percent Deviation from Nominal for any or all phases per Port and per Phase	Percent Increase for recovery	Seconds	Trigger ON/OFF & Maximum level
Frequency	Upper/Lower Frequency Limits per Port	Frequency Limits	Seconds	Trigger ON/OFF Frequency with max./min.
Over Current Warning	Percent Above Nominal System Setting per Port and per Phase	Percent Decrease for recovery	Seconds	Trigger ON/OFF & Maximum level
Over Current	Percent Above Nominal System Setting per Port and per Phase	Percent Decrease for recovery	Seconds	Trigger ON/OFF & Maximum level
Neutral Over Current	Percent Above Nominal System Setting Port 1 & 2 only	Percent Decrease for recovery	Seconds	Trigger ON/OFF & Maximum level
Sags	Percent Below Nominal 3 Detection Per Phase Function Blocks for User Port assignment	Percent Increase for recovery	Number of ¼ Cycles	Trigger ON/OFF & Minimum level Note: Logged as Trip with a set delay
Swells	Percent Above Nominal 3 Detection Per Phase Function Blocks for User Port assignment	Percent Decrease for recovery	Number of ¼ Cycles	Trigger ON/OFF & Maximum level Note: Logged as Trip with a set delay
Voltage THD	Percent Above Nominal System Setting Per Port and Per Phase	Percent Decrease for recovery	Seconds	Trigger ON/OFF & Maximum level
Over Temperature	Temperature Limits 3 coils plus 1 ambient	Temperature Limits	Seconds	Trigger ON/OFF & Maximum level

Note: All Events are logged with ON and OFF times and are user programmable for Logging, Horn and Output Actions

3.5 Comserver (WEB Server) Setup

The unit may be equipped a Powersmiths COMSERVER that facilitates communication with the device over an Ethernet connection using only a standard Internet Browser. Please refer to the Powersmiths Comserver Manual for setup instructions available from www.powersmersmiths.com/download.

4 Installation

Note that this section is provided for reference only, as the Cyberhawk-TX is factory installed on the transformer and setup for the specific system.

DANGER

Be familiar with the warnings given at the beginning of this manual and pay attention to additional Warnings, Cautions and Instructions presented throughout this manual. The use of recommended fusing will invariably be required by local codes and will prevent damage to the instrument or injury to personnel in the event of misconnection or inadvertent shorts.

4.1 Overview

The Cyberhawk-*TX* monitors the Electrical Parameters and also records and logs the programmed events with time/date stamps and generates alarms based on the user settings with control outputs based on the user selections.

The Cyberhawk-*TX* is connected to the electrical system via interface terminals to provide fuse protection for the voltage connections (input and output) and shorting CT blocks for the Current transformers. Shown below is a typical schematic diagram for the power system interface; additional interface terminals are also provided for temperature monitoring and TVSS status indication. Note that the PTs shown are used only for medium voltage systems.

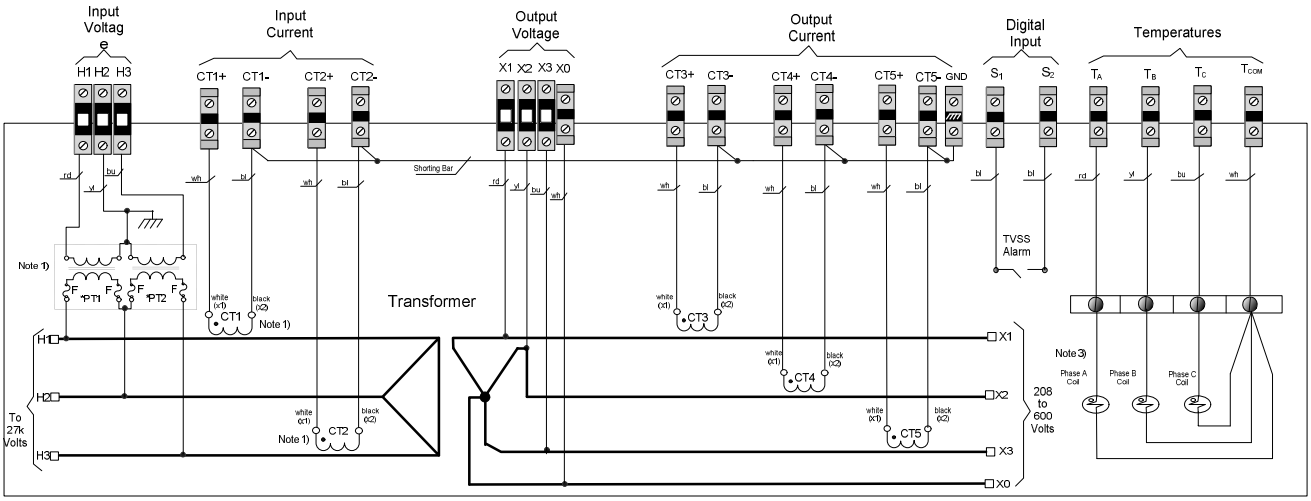


Figure 4-1 Schematic Interface diagram from the Transformer to Cyberhawk-TX

The Cyberhawk is wired to the interface terminals as shown in the schematic following

.

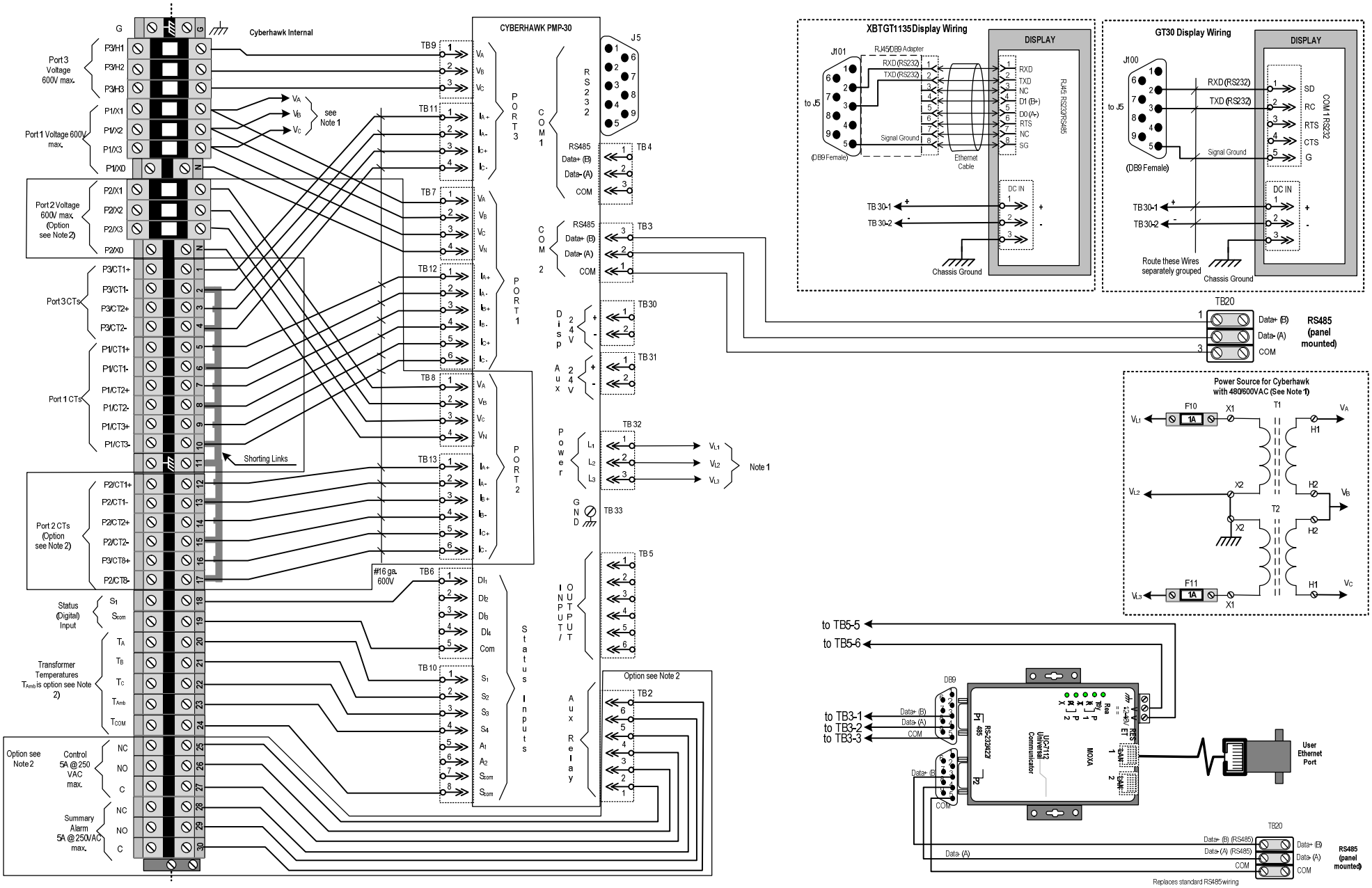


Figure 4-2: Schematic of internal Cyberhawk-TX schematic

4.2 Factory Default setups

The following setup tables document the default ship values (factory set). Note X indicates not applicable and a tick (√) factory set.

Note: Refer to the foregoing instructions for setup changes

Unit

MODEL:	*Cyberhawk-TX-*
Part No:	202-001523-
Serial No:	
Assigned IP:	• • •
Technician:	
Date/Signature	

General Programming			**ACK**
Item	**Description**	**Entry**	√
Password	Default "0" (Factory Setting)	0	√
Date/Time	Current Time/Date	-	√
Phase Correction (In Config. screen)	Set Phase Compensation (0.3 deg. Donut, 0.7 deg. Split Core)	0.3	√

Meter Configuration Port 1 (Port 1)			**ACK**
Item	**Description**	**Entry**	√
Configuration	0 - Disabled 1 - 3 Φ 3-wire (Delta) 2 - 3 Φ 4-wire (Wye)	2	√
Nominal Voltage	Nominal System Voltage (208, 480, etc.)	System 208 or 480	√
Nominal Current	Nominal System Current		√
Primary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)	System 208 or 480	√
Secondary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)	System 208 or 480	√
PT Correction Factor A	Enter Actual CF (Default 1.0000)	1.0000	√
PT Correction Factor B	Enter Actual CF (Default 1.0000)	1.0000	√
PT Correction Factor C	Enter Actual CF (Default 1.0000)	1.0000	√
CT Primary Current	CT Nominal Prim. Current	1000	√
CT Secondary Current	Default 5A	**5A**	-
CT Correction Factor A	Enter Actual CF (Default 1.0000)		√
CT Correction Factor B	Enter Actual CF (Default 1.0000)		√
CT Correction Factor C	Enter Actual CF (Default 1.0000)		√
I/O Assignment (for efficiency)	0 = none; 1 = Input; 2 = Output	2	√

Meter Configuration Port 2 (Port 2)			ACK
Item	**Description**	**Entry**	**X**
Configuration	0 - Disabled 1 - 3 Φ 3-wire (Delta) 2 - 3 Φ 4-wire (Wye)	2	
Nominal Voltage	Nominal System Voltage (208, 480, etc.)	System 208 or 480	
Nominal Current	Nominal System Current	1000	
Primary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)	System 208 or 480	
Secondary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)	System 208 or 480	
PT Correction Factor A	Enter Actual CF (Default 1.0000)	1.0000	
PT Correction Factor B	Enter Actual CF (Default 1.0000)	1.0000	
PT Correction Factor C	Enter Actual CF (Default 1.0000)	1.0000	
CT Primary Current	CT Nominal Prim. Current	1000	
CT Secondary Current	Leave Default at 5A	**5A**	
CT Correction Factor A	Enter Actual CF (Default 1.0000)	1.0000	
CT Correction Factor B	Enter Actual CF (Default 1.0000)	1.0000	
CT Correction Factor C	Enter Actual CF (Default 1.0000)	1.0000	
I/O Assignment (for efficiency)	0 = none; 1 = Input; 2 = Output	0	

Meter Configuration Port 3 (Port 3)			ACK
Item	**Description**	**Entry**	√
Configuration	0 - Disabled 1 - 3 Φ 3-wire (Delta)	1	√
Nominal Voltage	Nominal System Voltage (208, 480, etc.)	System 208 or 480	√
Nominal Current	Nominal System Current		√
Primary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)	System 208 or 480	√
Secondary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)	System 208 or 480	√
PT Correction Factor A	Enter Actual CF (Default 1.0000)	1.0000	√
PT Correction Factor B	Enter Actual CF (Default 1.0000)	1.0000	√
PT Correction Factor C	Enter Actual CF (Default 1.0000)	1.0000	√
CT Primary Current	CT Nominal Prim. Current	1000	√
CT Secondary Current	Default 5A	**5A**	-
CT Correction Factor A	Enter Actual CF (Default 1.0000)		√
CT Correction Factor C	Enter Actual CF (Default 1.0000)		√
I/O Assignment (for efficiency)	0 = none; 1 = Input; 2 = Output	1	√

Demand Setup			ACK
Item	**Description**	**Entry**	√
Demand Period	1 – 3600 seconds (1 hour)	60	√
Demand Number of Periods	1 – 60 periods	15	√

Over-Voltage Event Programming																				ACK
Item		**Description**										**Entry**								**X**
Over Voltage Threshold		Set Threshold in percentage of Nominal										110								√
Over Voltage Hysteresis		Set Hysteresis in percentage of Nominal										2								√
Over Voltage Delays		Set Delay Activation 'ON' & 'OFF' in seconds										ON: 2				OFF: 2				√
Port 1	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		1	0	0	0	0	0	0	0	0	√
Port 2	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		1	0	0	0	0	0	0	0	0	√
Port 3	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		1	0	0	0	0	0	0	0	0	√

Under-Voltage Event Programming																				ACK
Item		**Description**										**Entry**								**X**
Under Voltage Threshold		Set Threshold in percentage of Nominal										87								√
Under Voltage Hysteresis		Set Hysteresis in percentage of Nominal										2								√
Under Voltage Delays		Set Delay Activation 'ON' & 'OFF' in seconds										ON: 2				OFF: 2				√
Port 1	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		1	0	0	0	0	0	0	0	0	√
Port 2	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		1	0	0	0	0	0	0	0	0	√
Port 3	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		1	0	0	0	0	0	0	0	0	√

Voltage Imbalance Event Programming																				ACK
Item		**Description**										**Entry**								**X**
Imbalance Threshold		Set Threshold in percentage of Nominal										10								√
Imbalance Hysteresis		Set Hysteresis in percentage of Nominal										2								√
Imbalance Delays		Set Delay Activation 'ON' & 'OFF' in seconds										ON: 5				OFF: 5				√
Port 1	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		1	0	0	0	0	0	0	0	0	√
Port 2	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		1	0	0	0	0	0	0	0	0	√
Port 3	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		1	0	0	0	0	0	1	1	1	√

Phase Loss Event Programming																				ACK
Item		**Description**									**Entry**									√
Phase Loss Threshold		Set Threshold in percentage of Nominal									70									√
Phase Loss Hysteresis		Set Hysteresis in percentage of Nominal									10									√
Phase Loss Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON: 5				OFF: 5					
Port 1	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	1	0	0	0	0	0	1	1	1	√
Port 2	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	1	0	0	0	0	0	0	0	0	√
Port 3	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	1	0	0	0	0	0	0	0	0	√

Frequency Event Programming																				ACK
Item		**Description**									**Entry**									X
Frequency Threshold		Set Deviation in Hertz																		
Imbalance Hysteresis		Set Hysteresis in Hertz																		
Imbalance Delay s		Set Delay Activation 'ON' & 'OFF' in seconds									ON:				OFF:					
Event Action (global setting)	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	

Over-Current Warning Event Programming																				ACK
Item		**Description**									**Entry**									X
Over Current Threshold		Set Threshold in percentage of Nominal									105									
Over Current Hysteresis		Set Hysteresis in percentage of Nominal									2									
Over Current Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON: 1				OFF: 1					
Port 1	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	1	0	0	0	0	0	0	0	0	
Port 2	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Port 3	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	1	0	0	0	0	0	0	0	0	

Over-Current Alarm Event Programming																				ACK
Item		**Description**									**Entry**									**X**
Over Current Threshold		Set Threshold in percentage of Nominal																		
Over Current Hysteresis		Set Hysteresis in percentage of Nominal																		
Over Current Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON:				OFF:					
Port 1	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Port 2	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Port 3	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	

Over-Current Neutral Event Programming																				ACK
Item		**Description**									**Entry**									**X**
Over Current Threshold		Set Threshold in percentage of Nominal																		
Over Current Hysteresis		Set Hysteresis in percentage of Nominal																		
Over Current Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON:				OFF:					
Port 1	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Port 2	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	

Sag / Swell Block 1 Event Programming																				ACK
Item		**Description**									**Entry**									√
Port Assignment		Set Sag/Swell Block to Port									Port No: 1									√
Sag Threshold		Set Threshold in percentage of Nominal									85									√
Sag Hysteresis		Set Hysteresis in percentage of Nominal									5									√
Swell Threshold		Set Threshold in percentage of Nominal									115									√
Swell Hysteresis		Set Hysteresis in percentage of Nominal									5									√
Sag/Swell Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON: 0				OFF: 0					√
Sag	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	1	0	0	0	0	0	0	0	0	√
Swell	Bit No:	9	8	7	6	5	4	3	2	1										
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	1	0	0	0	0	0	0	0	0	√

Sag / Swell Block 2 Event Programming																				ACK
Item		**Description**									**Entry**									**X**
Port Assignment		Set Sag/Swell Block to Port									Port No: 2									
Sag Threshold		Set Threshold in percentage of Nominal									85									
Sag Hysteresis		Set Hysteresis in percentage of Nominal									5									
Swell Threshold		Set Threshold in percentage of Nominal									115									
Swell Hysteresis		Set Hysteresis in percentage of Nominal									5									
Sag/Swell Delays		Set Delay ON/OFF Activation in ¼ cycle periods									ON: 0				OFF: 0					
Sag Event Action	Bit No:	9	8	7	6	5	4	3	2	1	1	0	0	0	0	0	1	0	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1										
Swell Event Action	Bit No:	9	8	7	6	5	4	3	2	1	1	0	0	0	0	0	1	1	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1										

Sag / Swell Block 3 Event Programming																				ACK
Item		**Description**									**Entry**									**X**
Port Assignment		Set Sag/Swell Block to Port									Port No: 3									
Sag Threshold		Set Threshold in percentage of Nominal									85									
Sag Hysteresis		Set Hysteresis in percentage of Nominal									5									
Swell Threshold		Set Threshold in percentage of Nominal									115									
Swell Hysteresis		Set Hysteresis in percentage of Nominal									5									
Sag/Swell Delays		Set Delay ON/OFF Activation in ¼ cycle periods									ON: 0				OFF: 0					
Sag Event Action	Bit No:	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1										
Swell Event Action	Bit No:	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1										

Over-Temperature Warning/Shutdown Event Programming																				ACK
Item		**Description**									**Entry**									**X**
Temp. Alarm Threshold		Set Threshold in degrees Celsius																		
Temp. Alarm Hysteresis		Set Hysteresis in degrees Celsius																		
Temp. Shutdown Threshold		Set Threshold in degrees Celsius																		
Temp. Shutdown Hysteresis		Set Hysteresis in degrees Celsius																		
Over Temp. Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON:				OFF:					
Alarm Event Action	Bit No:	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1										
Shutdown Event Action	Bit No:	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1										

Ambient Over-Temperature Event Programming																				ACK
Item	**Description**										**Entry**									**X**
Temp. Alarm Threshold	Set Threshold in degrees Celsius																			
Temp. Alarm Hysteresis	Set Hysteresis in degrees Celsius																			
Over Temp. Delay ON	Set Delay Activation ON and OFF in seconds										ON:				OFF:					
Alarm Event Action	Bit No:	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1										

ID Label Programming			ACK
Item	**Description**	**Entry**	√
System Model Label	Label for System Model Name (16 digits)	CYBERHAWK-TX	√
System Serial No	System Serial Number (16 digits)		√
System Location Code	System Location Code (16 Digits)	T1000-C2-300	
Port 1 (Port 1)	Change Port name from Port 1	Output	√
Port 2 (Port 2)	Change Port name from Port 2		
Port 3 (Port 3)	Change Port name from Port 3	Input	√
Digital Input 1	Change Input name from Input 1		
Digital Input 2	Change Input name from Input 2		
Digital Input 3	Change Input name from Input 3		
Digital Input 4	Change Input name from Input 4		
Digital Input 5	Change Input name from Input 5		
Digital Input 6	Change Input name from Input 6		
Digital Input 7	Change Input name from Input 7		
Digital Input 8	Change Input name from Input 8		
Relay 1	Change name from Relay 1		
Relay 2	Change name from Relay 2		
Dig. Out 1 (Horn)	Change name from Horn		
Dig. Out 2	Change name from Dig. O/P 2		
Relay 3	Change name from Relay 3		
Relay 4	Change name from Relay 4		
Relay 5	Change name from Relay 5		
Relay 6	Change name from Relay 6		

Digital Input /Output Polarity															ACK
Item	**Description**		**Entry**												**X**
Digital Inputs 1 – 12	Polarity setting (0 Normal, 1-Inverted)	Bit No.	12	11	10	9	8	7	5	5	4	3	2	1	
		String	0	0	0	0	0	0	0	0	0	0	0	0	
Outputs 1 – 8	Polarity setting (0 Normal, 1-Inverted)	Bit No.					8	7	5	5	4	3	2	1	
		String					0	0	0	0	0	0	0	1	

Digital Input Event Programming																				ACK
Item	**Description**											**Entry**								**X**
Digital Input 1	Debounce Time in milliseconds											0								
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Digital Input 2	Debounce Time in milliseconds											0								
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	1	0	1	
Digital Input 3	Debounce Time in milliseconds											0								
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	1	0	1	
Digital Input 4	Debounce Time in milliseconds											0								
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	1	0	1	
Digital Input 5	Debounce Time in milliseconds																			
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Digital Input 6	Debounce Time in milliseconds																			
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Digital Input 7	Debounce Time in milliseconds																			
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Digital Input 8	Debounce Time in milliseconds																			
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Emergency Power OFF	Debounce Time in milliseconds																			
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Phase Reversal Port 1 (Port 1)	Debounce Time in milliseconds																			
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Phase Reversal Port 2 (Port 2)	Debounce Time in milliseconds																			
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	
Phase Reversal Port 3 (Port 3)	Debounce Time in milliseconds																			
	Bit No:	9	8	7	6	5	4	3	2	1										
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0	0	0	0	0	0	0	

5 Communication Hookup

The unit is fully factory installed and integrated with the transformer with communication network connections the only installation required.

5.1.1 Communication Ports

A RS485 communication port supporting Modbus RTU is provided with an Ethernet Port an option. The Ethernet Port is available with Modbus TCP Gateway and/or WEB Server for direct browser. The communication Ports are located at the right rear of the unit under the cover as shown in the illustration below:

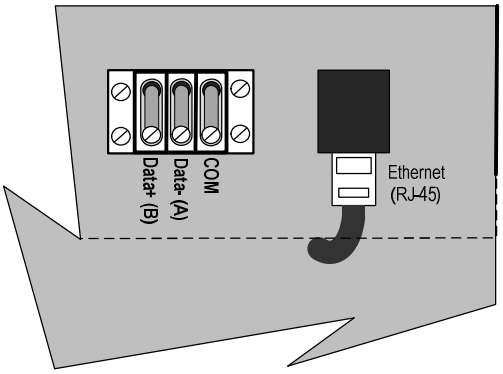


Figure 5-1: Communication Ports (rear of unit)

To access and connect the RS485 port:

- Unscrew the two screws at the front of the lid and swing the lid up and towards the rear
- Connect the RS485 network cables using a low capacitance shielded twisted pair (e.g. Belden 9841 or equivalent) noting guidelines following
- Replace lid by hooking rear of lid to the rear tabs on the case and replace front screws

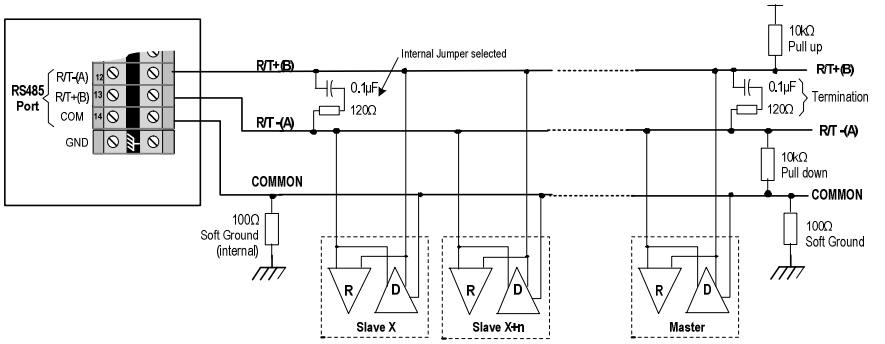
To access and connect the Ethernet Port:

- Plug RJ45 terminated CAT5 Ethernet cable into jack under the lid noting guidelines following

5.1.1.1 RS485 Port (no Ethernet Port installed)

The following table defines the characteristics of the RS485 Port supported directly by the Cyberhawk-Tx metering device. The number of devices that may be daisy chained depends on the characteristics of the RS485 transceivers. Each end of the network should be terminated with a 120 ohm resistor.

Table 5-1: RS485 Characteristics supported by Cyberhawk meter

Parameter	Description	Typical RS485 Connection
Connections	Com (Shield) R/T – (A) R/ T + (B)	
Connector	Compression; 12 to 24 ga. wire	
Baud Rate	1,200 to 19,200	
Max. Range	1,200 m	
Wiring (typical)	300V, 75°C #18 – 24 ga. Z = 120 ohms	
Termination (internal)	120 ohms* (jumper selected)	
Protocol	Modbus RTU	

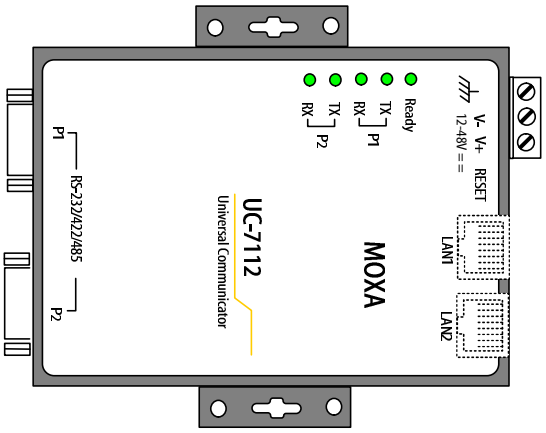
** To disable internal termination remove link J3 on internal Cyberhawk PMP30*

5.1.2 Ethernet Port (Gateway or Web Server)

The unit may be equipped with an Ethernet Port for Gateway or WEB Server capability. The Ethernet port characteristics are given in the table below:

Table 5-2: Ethernet Port Characteristics

Parameter	Description	WEB Server (internal)
Bit rate	10/100 BaseT	
Connection	RJ45	
Isolation	1,500V	
Location	Externally accessible RJ45 Port at rear	
Protocols	TCP/IP, Modbus TCP	
IP Addressing	DHCP Client (dynamic and static)	



Note:
Unit is factory shipped with dynamic addressing enabled which may be changed to static at setup.

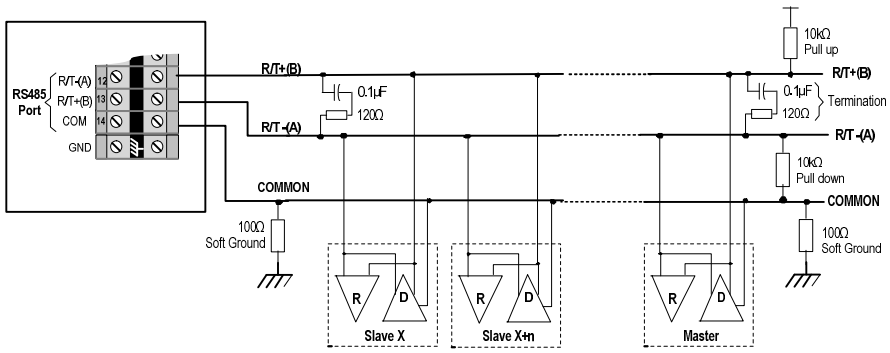
Note: It is be advisable *to check with the local IT administrator prior to actually connecting the unit to the network for pre-assignment of Network IP addresses; refer to the COMERVER manual for detailed setup instructions.*

5.1.2.1 RS485 Port (Ethernet Port installed)

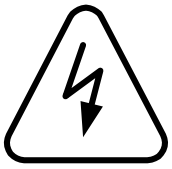
When equipped with an Ethernet Port the external RS485 Port is supported by the WEB Server and the following table defines the characteristics of the RS485 Port supported by the Ethernet network device. The number of devices that may be daisy chained depends on the characteristics of the RS485 transceivers. Each end of the network should be terminated with a 120 ohm resistor. For details and setup of this Port please refer to the Powersmiths COMSERVER Manual.

Table 5-3: COMSERVER supported RS485 communication

Parameter	Description	Typical RS485 Connection
Connections	Com (Shield) R/T – (A) R/ T + (B)	
Connector	Compression; 12 to 24 ga. wire	
Baud Rate	1,200 to 38,400	
Max. Range	1,200 m	
Wiring (typical)	300V, 75°C #18 – 24 ga. Z = 120 ohms	
Termination	120 ohms (external)	
Protocol	Modbus RTU	



6 Maintenance

DANGER	HAZARD OF ELECTRIC SHOCK OR ARC FLASH
	***This equipment to be maintained only by qualified personnel*** ***Before working on this equipment ensure that all power is off and locked out*** ***More than one upstream Disconnect may be required to de-energize this equipment*** ***Use appropriate personal protective equipment (PPE) and follow safe electrical work practices (see NFPA 70E)*** ***Ensure all covers and doors are in a closed condition prior to applying power***

6.1 Maintenance Requirements

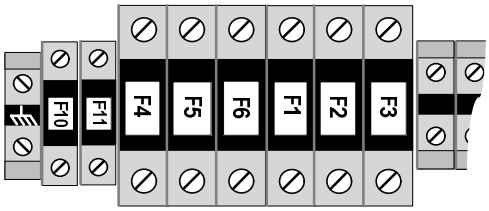
The Cyberhawk-*TX* does not require any maintenance by the user except for periodically changing the 3-volt lithium battery used for time keeping backup only. The battery is expected to have a service life in excess of 10 years in normal operating conditions. A low battery warning will be given when the battery requires replacement.

6.2 Replacement Fuses

The unit incorporates internal fuses, the function of which is for safety and equipment protection in event of a catastrophic component failure. Fuse replacement information is listed below:

Table 6-1: Table of fuse replacements

Fuse	Rating	Type	Replacements
F1 – F6	2 Amp	10 x 38 mm Fast Blow	Bussmann: KTK-2 Ferraz Shawmut: ATM2
F10, F11	½ Amp	5 x 20 mm Time Delay	Littelefuse: 218P 0.5A Bussmann: GDC-500MA



6.3 Calibration

Calibration is not normally required through the life of the product.

6.4 Replacement Battery

The Cyberhawk-PMP30 utilizes a standard 3-volt lithium battery used for time keeping backup, which has an expected service life in excess of 10 years in operation. A low battery warning will be given when the battery requires replacement. Suitable replacement battery types are UL approved types CR2032 such as Panasonic, Sony or Eveready CR2032, which is a common computer clock battery type.

The battery holder is located on the *Cyberhawk-PMP 30* beside the communication and auxiliary relay terminals. *Note that prior to changing the battery, it is preferable that power be removed from the unit.* To change the clock battery, place fingers on both sides of the battery holder below the rim, slide the battery up and remove it. To insert battery, slide battery into holder; the holder is polarized to prevent incorrect polarity insertion. The clock will not normally require resetting if this procedure is completed within a couple of minutes.

6.5 Normal Operation

Normal operation of the monitor is indicated by the “Heart-beat” LED.

Figure 6-1: Location of Heartbeat Light on Power Monitor (Cyberhawk-PMP 30)

6.6 Overview (reference only)

Note that this section is provided for reference only, as the Cyberhawk-TX is factory installed on the transformer and factory setup for the specific system.

The Cyberhawk-*TX* is connected to the electrical system via interface terminals. Voltage sensing for Low Voltage Systems is by direct connection through touch-safe Fused Disconnects. An interface Potential Transformer (PT) is used with Medium Voltage Systems. Current sensing is by means of transformer mounted CTs connected to the Cyberhawk-Tx via shorting CT blocks to facilitate field service (in case the Cyberhawk-PMP30 requires field replacement. Shown below is a typical schematic diagram for the power system interface; additional interface terminals are also provided for temperature monitoring and SPD (TVSS) status indication.

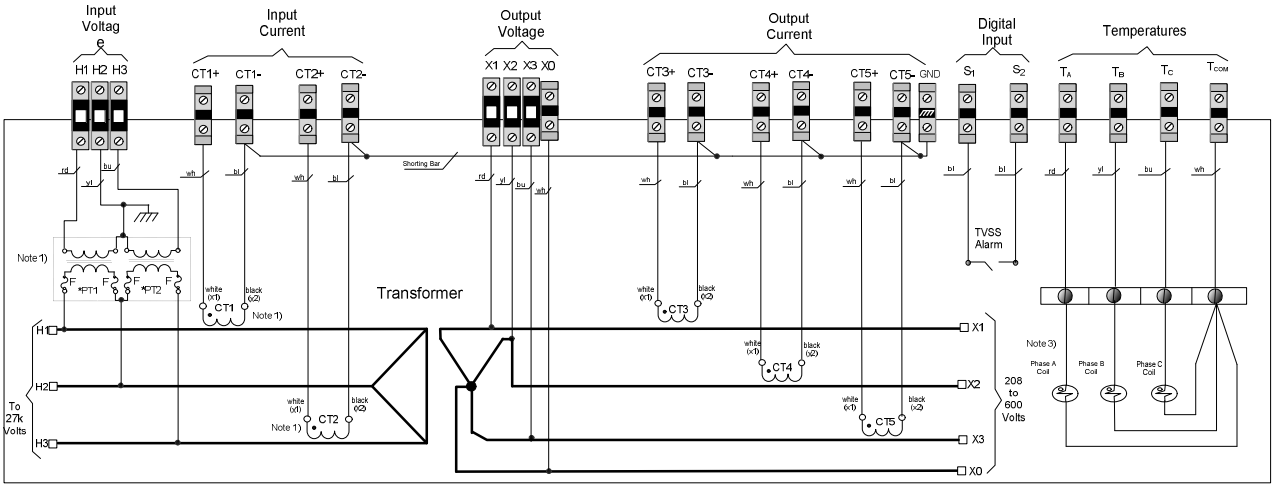


Figure 6-2: Typical schematic interface diagram from the Transformer to Cyberhawk-Tx.

6.7 Internal terminals

The internal interface terminal (Cyberhawk to transformer) is shown below for reference.

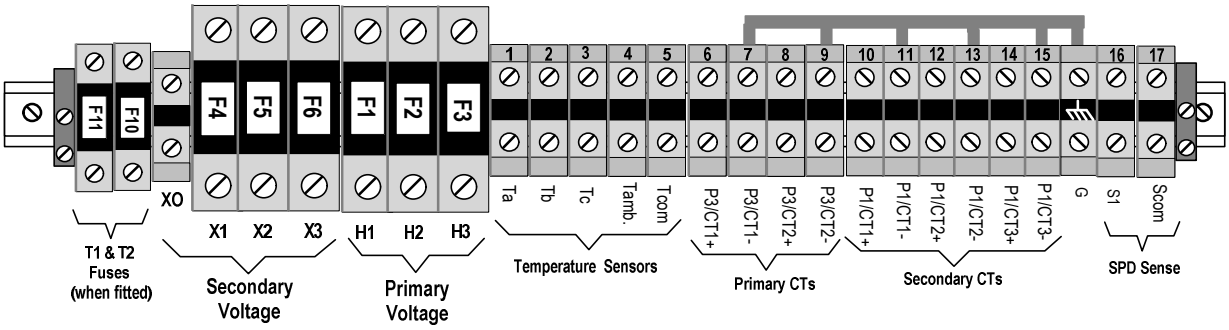


Figure 6-3: Internal interface terminal layout

6.8 Internal Cyberhawk-Tx Schematic

The Cyberhawk is wired to the interface terminals as shown in the schematic following.

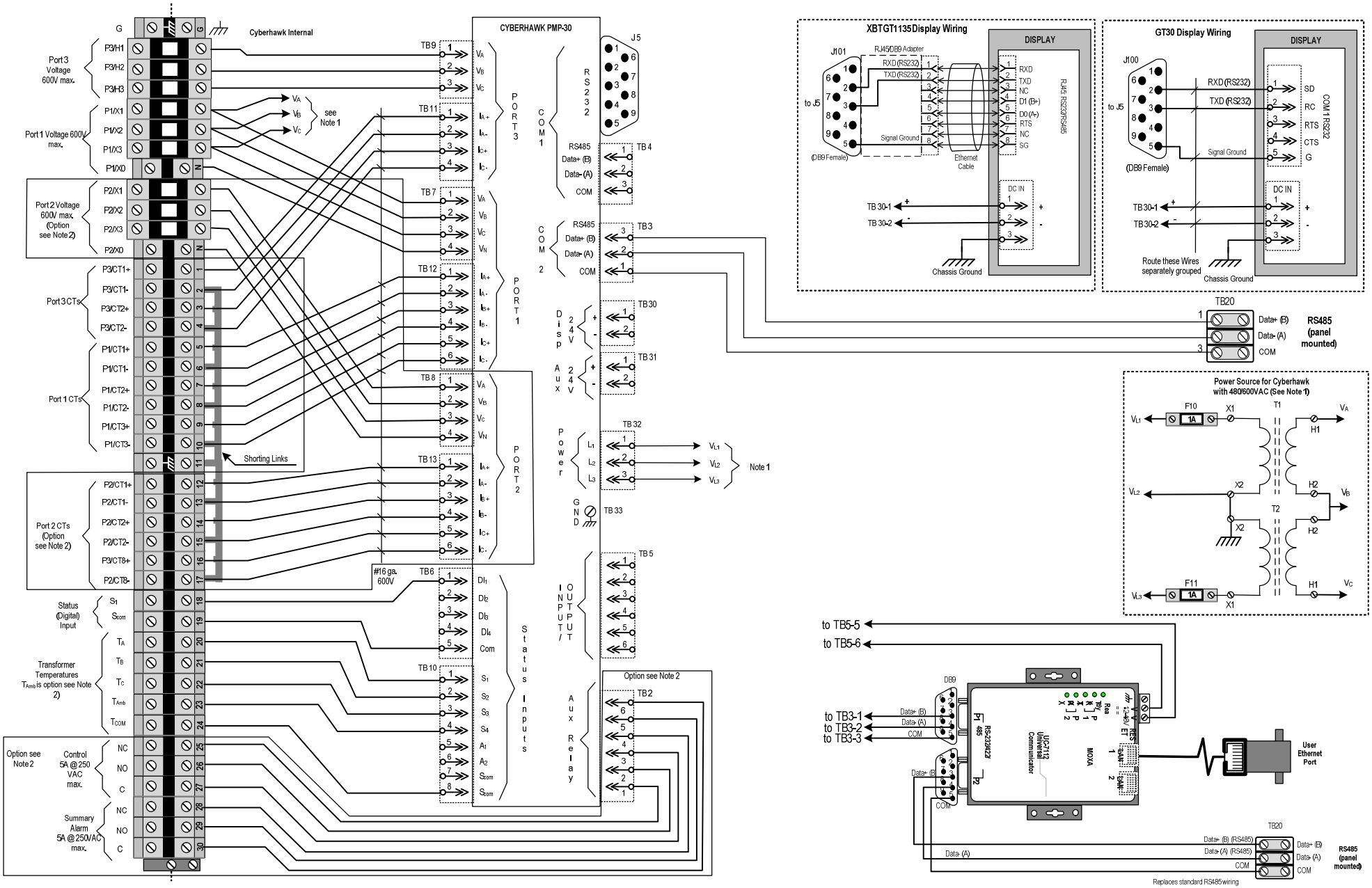


Figure 6-4: Schematic of internal Cyberhawk-TX schematic

7 Appendix1: Programming Chart Record

The following charts are provided to record field setup programming. (Note: Make copies as required).

Instructions: To program this unit, follow instructions as given in Section 5 of the manual. Note: Use a tick (√) to acknowledge and X where not applicable

Unit

MODEL:	*Cyberhawk-TX-*
Part No:	202-001523-
Serial No:	
Assigned IP:	• • •
Technician:	
Date/Signature	

General Programming			**ACK**
Item	**Description**	**Entry**	
Password	Default "0" (Factory Setting)		
Date/Time	Current Time/Date		
Phase Correction (In Config. screen)	Set Phase Compensation (0.3 deg. Donut, 0.7 deg. Split Core)		

Meter Configuration Port 1 (Port 1)			**ACK**
Item	**Description**	**Entry**	
Configuration	0 - Disabled 1 - 3 Φ 3-wire (Delta) 2 - 3 Φ 4-wire (Wye)		
Nominal Voltage	Nominal System Voltage (208, 480, etc.)		
Nominal Current	Nominal System Current		
Primary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)		
Secondary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)		
PT Correction Factor A	Enter Actual CF (Default 1.0000)		
PT Correction Factor B	Enter Actual CF (Default 1.0000)		
PT Correction Factor C	Enter Actual CF (Default 1.0000)		
CT Primary Current	CT Nominal Prim. Current		
CT Secondary Current	Default 5A	**5A**	
CT Correction Factor A	Enter Actual CF (Default 1.0000)		
CT Correction Factor B	Enter Actual CF (Default 1.0000)		
CT Correction Factor C	Enter Actual CF (Default 1.0000)		
I/O Assignment (for efficiency)	0 = none; 1 = Input; 2 = Output		

Meter Configuration Port 2 (Port 2)			ACK
Item	**Description**	**Entry**	
Configuration	0 - Disabled 1 - 3 Φ 3-wire (Delta) 2 - 3 Φ 4-wire (Wye)		
Nominal Voltage	Nominal System Voltage (208, 480, etc.)		
Nominal Current	Nominal System Current		
Primary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)		
Secondary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)		
PT Correction Factor A	Enter Actual CF (Default 1.0000)		
PT Correction Factor B	Enter Actual CF (Default 1.0000)		
PT Correction Factor C	Enter Actual CF (Default 1.0000)		
CT Primary Current	CT Nominal Prim. Current		
CT Secondary Current	Leave Default at 5A		
CT Correction Factor A	Enter Actual CF (Default 1.0000)		
CT Correction Factor B	Enter Actual CF (Default 1.0000)		
CT Correction Factor C	Enter Actual CF (Default 1.0000)		
I/O Assignment (for efficiency)	0 = none; 1 = Input; 2 = Output		

Meter Configuration Port 3 (Port 3)			ACK
Item	**Description**	**Entry**	
Configuration	0 - Disabled 1 - 3 Φ 3-wire (Delta)		
Nominal Voltage	Nominal System Voltage (208, 480, etc.)		
Nominal Current	Nominal System Current		
Primary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)		
Secondary PT Volts	PT Primary Voltage (With no PTs enter nominal System Voltage)		
PT Correction Factor A	Enter Actual CF (Default 1.0000)		
PT Correction Factor B	Enter Actual CF (Default 1.0000)		
PT Correction Factor C	Enter Actual CF (Default 1.0000)		
CT Primary Current	CT Nominal Prim. Current		
CT Secondary Current	Default 5A		
CT Correction Factor A	Enter Actual CF (Default 1.0000)		
CT Correction Factor C	Enter Actual CF (Default 1.0000)		
I/O Assignment (for efficiency)	0 = none; 1 = Input; 2 = Output		

Demand Setup			ACK
Item	**Description**	**Entry**	
Demand Period	1 – 3600 seconds (1 hour)		
Demand Number of Periods	1 – 60 periods		

Over-Voltage Event Programming												ACK
Item		**Description**									**Entry**	
Over Voltage Threshold		Set Threshold in percentage of Nominal										
Over Voltage Hysteresis		Set Hysteresis in percentage of Nominal										
Over Voltage Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON: OFF:	
Port 1	Bit No:	9	8	7	6	5	4	3	2	1		
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Port 2	Bit No:	9	8	7	6	5	4	3	2	1		
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Port 3	Bit No:	9	8	7	6	5	4	3	2	1		
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		

Under-Voltage Event Programming												ACK
Item		**Description**									**Entry**	
Under Voltage Threshold		Set Threshold in percentage of Nominal										
Under Voltage Hysteresis		Set Hysteresis in percentage of Nominal										
Under Voltage Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON: OFF:	
Port 1	Bit No:	9	8	7	6	5	4	3	2	1		
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Port 2	Bit No:	9	8	7	6	5	4	3	2	1		
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Port 3	Bit No:	9	8	7	6	5	4	3	2	1		
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		

Voltage Imbalance Event Programming												ACK
Item		**Description**									**Entry**	
Imbalance Threshold		Set Threshold in percentage of Nominal										
Imbalance Hysteresis		Set Hysteresis in percentage of Nominal										
Imbalance Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON: OFF:	
Port 1	Bit No:	9	8	7	6	5	4	3	2	1		
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Port 2	Bit No:	9	8	7	6	5	4	3	2	1		
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Port 3	Bit No:	9	8	7	6	5	4	3	2	1		
Event Action	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		

Phase Loss Event Programming												ACK
Item		**Description**									**Entry**	
Phase Loss Threshold		Set Threshold in percentage of Nominal										
Phase Loss Hysteresis		Set Hysteresis in percentage of Nominal										
Phase Loss Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON: OFF:	
Port 1 Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Port 2 Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Port 3 Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		

Frequency Event Programming												ACK
Item		**Description**									**Entry**	
Frequency Threshold		Set Deviation in Hertz										
Imbalance Hysteresis		Set Hysteresis in Hertz										
Imbalance Delay s		Set Delay Activation 'ON' & 'OFF' in seconds									ON: OFF:	
Event Action (global setting)	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		

Over-Current Warning Event Programming												ACK
Item		**Description**									**Entry**	
Over Current Threshold		Set Threshold in percentage of Nominal										
Over Current Hysteresis		Set Hysteresis in percentage of Nominal										
Over Current Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON: OFF:	
Port 1 Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Port 2 Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Port 3 Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		

Over-Current Alarm Event Programming													ACK
Item		**Description**									**Entry**		
Over Current Threshold		Set Threshold in percentage of Nominal											
Over Current Hysteresis		Set Hysteresis in percentage of Nominal											
Over Current Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON:	OFF:	
Port 1 Event Action	Bit No:	9	8	7	6	5	4	3	2	1			
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1			
Port 2 Event Action	Bit No:	9	8	7	6	5	4	3	2	1			
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1			
Port 3 Event Action	Bit No:	9	8	7	6	5	4	3	2	1			
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1			

Over-Current Neutral Event Programming													ACK
Item		**Description**									**Entry**		
Over Current Threshold		Set Threshold in percentage of Nominal											
Over Current Hysteresis		Set Hysteresis in percentage of Nominal											
Over Current Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON:	OFF:	
Port 1 Event Action	Bit No:	9	8	7	6	5	4	3	2	1			
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0 0 0 0 0 0 0 0
Port 2 Event Action	Bit No:	9	8	7	6	5	4	3	2	1			
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	0	0	0 0 0 0 0 0 0 0

Sag / Swell Block 1 Event Programming													ACK
Item		**Description**									**Entry**		
Port Assignment		Set Sag/Swell Block to Port									Port No:		
Sag Threshold		Set Threshold in percentage of Nominal											
Sag Hysteresis		Set Hysteresis in percentage of Nominal											
Swell Threshold		Set Threshold in percentage of Nominal											
Swell Hysteresis		Set Hysteresis in percentage of Nominal											
Sag/Swell Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON:	OFF:	
Sag Event Action	Bit No:	9	8	7	6	5	4	3	2	1			
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1			
Swell Event Action	Bit No:	9	8	7	6	5	4	3	2	1			
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1			

Sag / Swell Block 2 Event Programming												ACK
Item		**Description**									**Entry**	
Port Assignment		Set Sag/Swell Block to Port									Port No:	
Sag Threshold		Set Threshold in percentage of Nominal										
Sag Hysteresis		Set Hysteresis in percentage of Nominal										
Swell Threshold		Set Threshold in percentage of Nominal										
Swell Hysteresis		Set Hysteresis in percentage of Nominal										
Sag/Swell Delays		Set Delay ON/OFF Activation in ¼ cycle periods									ON: / OFF:	
Sag Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Swell Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		

Sag / Swell Block 3 Event Programming												ACK
Item		**Description**									**Entry**	
Port Assignment		Set Sag/Swell Block to Port									Port No:	
Sag Threshold		Set Threshold in percentage of Nominal										
Sag Hysteresis		Set Hysteresis in percentage of Nominal										
Swell Threshold		Set Threshold in percentage of Nominal										
Swell Hysteresis		Set Hysteresis in percentage of Nominal										
Sag/Swell Delays		Set Delay ON/OFF Activation in ¼ cycle periods									ON: / OFF:	
Sag Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Swell Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		

Over-Temperature Warning/Shutdown Event Programming												ACK
Item		**Description**									**Entry**	
Temp. Alarm Threshold		Set Threshold in degrees Celsius										
Temp. Alarm Hysteresis		Set Hysteresis in degrees Celsius										
Temp. Shutdown Threshold		Set Threshold in degrees Celsius										
Temp. Shutdown Hysteresis		Set Hysteresis in degrees Celsius										
Over Temp. Delays		Set Delay Activation 'ON' & 'OFF' in seconds									ON: / OFF:	
Alarm Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		
Shutdown Event Action	Bit No:	9	8	7	6	5	4	3	2	1		
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1		

Ambient Over-Temperature Event Programming												ACK
Item	**Description**									**Entry**		
Temp. Alarm Threshold	Set Threshold in degrees Celsius											
Temp. Alarm Hysteresis	Set Hysteresis in degrees Celsius											
Over Temp. Delay ON	Set Delay Activation ON and OFF in seconds									ON:	OFF:	
Alarm Event Action Bit No:	9	8	7	6	5	4	3	2	1			
Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1			

ID Label Programming			ACK
Item	**Description**	**Entry**	
System Model Label	Label for System Model Name (16 digits)		
System Serial No	System Serial Number (16 digits)		
System Location Code	System Location Code (16 Digits)		
Port 1 (Port 1)	Change Port name from Port 1		
Port 2 (Port 2)	Change Port name from Port 2		
Port 3 (Port 3)	Change Port name from Port 3		
Digital Input 1	Change Input name from Input 1		
Digital Input 2	Change Input name from Input 2		
Digital Input 3	Change Input name from Input 3		
Digital Input 4	Change Input name from Input 4		
Digital Input 5	Change Input name from Input 5		
Digital Input 6	Change Input name from Input 6		
Digital Input 7	Change Input name from Input 7		
Digital Input 8	Change Input name from Input 8		
Relay 1	Change name from Relay 1		
Relay 2	Change name from Relay 2		
Dig. Out 1 (Horn)	Change name from Horn		
Dig. Out 2	Change name from Dig. O/P 2		
Relay 3	Change name from Relay 3		
Relay 4	Change name from Relay 4		
Relay 5	Change name from Relay 5		
Relay 6	Change name from Relay 6		

Digital Input /Output Polarity														ACK
Item	**Description**		**Entry**											
Digital Inputs 1 – 12	Polarity setting (0 Normal, 1-Inverted)	Bit No.	12	11	10	9	8	7	5	5	4	3	2	1	
		String													
Outputs 1 – 8	Polarity setting (0 Normal, 1-Inverted)	Bit No.													
		String													

Digital Input Event Programming											ACK
Item	**Description**										**Entry**
Digital Input 1	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	
Digital Input 2	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	
Digital Input 3	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	
Digital Input 4	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	
Digital Input 5	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	
Digital Input 6	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	
Digital Input 7	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	
Digital Input 8	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	
Emergency Power OFF	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	
Phase Reversal Port 1 (Port 1)	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	
Phase Reversal Port 2 (Port 2)	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	
Phase Reversal Port 3 (Input)	Debounce Time in milliseconds										
	Bit No:	9	8	7	6	5	4	3	2	1	
	Output Action	Event Log	Relay 6	Relay 5	Relay 4	Relay 3	Dig. O/P2	Dig. O/P1	Relay 2	Relay 1	